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MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

MARCH, 1890.

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PREPARED UNDER THE DIRECTION OF
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List of merchant marine steam and sailing vessels from which International Meteorological reports were received at the office of the Chief Signal Officer, U. S. Army, Washington City, in time to be used in the preparation of the Monthly Weather Review for March, 1890.

Name of vessel.	Captain.	Name of vessel.	Captain.	Name of vessel.	Captain.
Br. a. s. Abyssinia	Geo. A. Lee.	Br. a. s. Gallia	M. Murphy.	Am. a. s. Pennsylvania	E. B. Thomas.
Br. Adirondack	J. Sanson.	Germania	J. G. Cameron.	Br. Peruvian	J. M. Wallace.
Br. Adriatic	W. Roberts.	Glendora	O. H. Bommen.	Br. Pocahontas	J. James.
Br. Advance	D. E. Griffiths.	Glennath	C. I. Anderson.	Ger. Polaris	F. Schroder.
Br. Agassiz	J. Adair.	Gloucester City	R. Jones.	Br. Polynesian	A. C. Whyte.
Br. Albatross	J. W. Morris.	Gothia	A. Kahn.	Am. Portia	F. Ash.
Br. Alameda	H. G. Morse.	Greece	A. J. Jeffrey.	Br. Prinz Fred Hendrik	J. Borgdrager.
Br. Alarich	C. Eggers.	Gut Heil	A. Buhner.	Br. Prinz Maasrits	A. Sibbel.
Br. Alaska	W. L. Robertson.	Habsburg	G. Thumann.	Br. Prussian	C. H. Calvert.
Br. Albany	H. A. Gough.	Hampton	H. Bower.	Br. Prydian	M. Parry.
Br. Algon	E. J. Seider.	Hannover	H. Gathemann.	Br. Reading	Jas. Guy.
Br. Algiers	F. W. Mason.	Haytian	J. Coward.	Br. Rheinis	H. Vogelgesang.
Br. Alton	H. Christoffers.	Hekin	A. G. Thomsen.	Br. Rhein	W. Kuhlmann.
Br. Alva	F. McKay.	Helvetia	R. Landerer.	Br. Rhenania	C. Schaffer.
Br. Alvo	David Williams.	Hermann	Bodeker.	Br. Rhosina	T. Pearn.
Br. America	A. Kohlmann.	Hibernian	J. Brown.	Br. Rhynland	R. Weyer.
Br. American	W. Anson.	Hindoo	Jas. Douglas.	Br. Richmond	E. S. Clapp.
Br. Amsterdam	G. Stenger.	Holland	Thos. Foote.	Br. Rochdale	F. D. Tindall.
Br. Ancherley	A. Campbell.	Holantia	G. Busch.	Br. Roman	E. Maddox.
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Br. Ardagh	W. Anderson.	India	Hulsen.	Br. Runic	T. P. Thompson.
Br. Astor Hall	A. Fowler.	Indiana	W. J. Boggs.	Br. Russia	A. Schiel.
Br. Athos	H. Low.	Iowa	E. W. Owens.	Br. Saale	H. Richter.
Br. Aurania	H. Mackay.	Irrington	C. W. Barnard.	Br. Saint Roman	H. Campbell.
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Br. Brunschweig	H. Davison.	La Champagne	Boyer.	Br. Silesia	T. P. Fisher.
Br. Britannie	E. Wills.	La Flandre	M. W. Nines.	Br. Specialist	C. H. Hossack.
Br. British Empire	E. H. Freeth.	La Gascogne	Santelli.	Br. State of Nebraska	A. G. Brues.
Br. British Prince	W. Pitt.	Lahn	H. Hollmers.	Br. State of Nevada	A. A. Stewart.
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Br. Canada	E. Penney.	Leona	James Bolger.	Br. Switzerland	J. Ueberweg.
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Br. Cephalonia	J. B. Percy.	Lord Gough	E. M. Hughes.	Br. Thanemore	A. J. Baxter.
Br. Chalmette	M. C. Olivier.	Lord O'Neil	J. Davie.	Br. The Queen	T. P. Healey.
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Br. Colan	R. C. Jennings.	Merchant Prince	S. P. Hoskins.	Br. Virginian	W. C. Fry.
Br. Colina	A. Cornor.	Michigan	S. Walters.	Br. Waeland	C. H. Grant.
Br. Colonist	A. Worpel.	Minia	Sam. Trott.	Br. Waterloo	J. P. Turner.
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INTRODUCTION.

This REVIEW is based on reports for March, 1890, from 2,311 regular and voluntary observers. These reports are classified as follows: 171 reports from Signal Service stations; 121 reports from United States Army post surgeons; 7 reports of rainfall observations of the United States Geological Survey in New Mexico; 1,420 monthly reports from state weather service and voluntary observers; 23 reports from Canadian stations; 183 reports through the Central Pacific Railway Company; 386 marine reports through the co-operation of the Hydrographic Office, Navy Department; marine

reports through the "New York Herald Weather Service;" monthly weather reports from the local weather services of Alabama, Arkansas, Colorado, Illinois, Indiana, The Iowa Weather Crop Bulletin Service, Kansas, Kentucky, Louisiana, Michigan, Minnesota, Missouri, Meteorological Report of the Missouri State Board of Agriculture, Nebraska, Nevada, New England, New Jersey, New York, North Carolina, North and South Dakota, Ohio, Oregon, Pennsylvania, South Carolina, and Tennessee, and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used.

CHARACTERISTICS OF THE WEATHER FOR MARCH, 1890.

The great flood in the lower Mississippi valley, which continued throughout the month, and the group of destructive tornadoes in Kentucky, southern Indiana, southern Illinois, and southeastern Missouri on the 27th, constituted the more remarkable features of the month. At most of the important points along the lower Mississippi river the water was the highest ever known, but the levees were in better condition than during great floods of preceding years, and many of the more important levees were firm and in good condition at the close of the month. On the 4th the water reached the danger line, 34.0 feet, at Memphis, Tenn. On the 11th the high water mark of 1874, 16.2 feet, was reached at New Orleans, La. On the 13th the water reached 17.0 feet on the gauge at New Orleans, La., the highest point ever reached at that place, but no material injury was reported. On this date the stage of the water was 36.5 feet at Memphis, Tenn., this reading being 0.1 foot higher than ever before recorded at that point. On the 14th a gauge reading of 36.6 feet was noted at Memphis, Tenn. On the 27th the water at Arkansas City, Ark., was 2.2 feet above the high water mark of 1884. On the 9th crevasses occurred in the levees at Sappington Hook, Ark., and Alsatia, La.; on the 12th there was a break in the main levee at Alsatia, La.; on the 13th crevasses occurred at Nita Plantation and Plattenville, La., and Mayersville, Miss.; on the 14th crevasses occurred twelve miles below Donaldsonville, La., and at Bohemia, La.; on the 15th a crevasse occurred at Pecan Grove, La., this being the largest break reported for the month; on the 18th crevasses occurred at Offutt, Miss., and Luna, Ark.; on the 20th, at Jesuit Bend, La.; on the 25th, about one and one-half mile above Arkansas City, Ark.; on the 26th, at Skipwith, Miss., and Live Oak, La.; on the 27th, at Laconia, Ark.; on the 28th, at Columbia, Ark., Easton and Huntington, Miss.; on the 30th, at Austin, Miss.; and on the 31st at Greenville, Miss. Along the Ohio River and its tributaries flood conditions prevailed throughout the month, causing heavy losses and much suffering in low lying districts. At the close of the month the rivers were above the danger line from Cincinnati to the Gulf of Mexico, and the outlook in the lower Mississippi valley was discouraging.

The tornadoes of the 27th in Kentucky, southern Indiana, southern Illinois, and southeastern Missouri developed in the southeast quadrant of a low pressure storm which had advanced from the north Pacific coast southeastward to Colorado, and thence eastward over Kansas, Missouri, and Illinois, and within three hundred miles of the storm-centre. The most destructive of this group of tornadoes occurred in Kentucky, where upwards of one hundred lives were lost, and property to the value of about \$4,000,000 was destroyed. In Louisville, alone, the loss of life was seventy-six, and many persons were injured, and the losses to property aggregated about \$2,500,000. In Indiana the severest storms occurred in the extreme southern part of the state, where, at Jeffersonville, the Louisville tornado, which crossed the river at that point, demolished many buildings, without, however, an attendant loss of life. In Illinois seven lives are known to have been lost, many persons were injured, and the damage to property amounted to at least \$200,000. In southeastern Missouri four lives were lost, while the reported damage to property is not heavy. In Tennessee severe wind storms caused the loss of several lives, and the damage to property was very great. Destructive wind and hail storms prevailed on this date from the Rocky Mountains eastward over the Ohio Valley and Lake region, but no lives were lost west of the Missouri River. Tornadoes were also reported at Excelsior, Ark., on the 11th, where a number of persons were injured and houses demolished; on the 22d, in Georgia, North Carolina, and South Carolina, where several persons were killed and much damage was done to buildings; and on the 21st a severe storm damaged crops at Howe, Tex.

The highest temperature reported was 105°, at Camp del Rio, Tex., on the 20th, and the lowest temperature noted was -40°, at Pokegama Falls, Minn., on the 5th. The month was warmer than the average March along the eastern slope of the Rocky Mountains, along the immediate Atlantic coast north of South Carolina, in New England, the Canadian Maritime Provinces, the Saint Lawrence Valley, the eastern part of the lower lake region, and in eastern Manitoba. In all other sections of the country the month was cooler than usual, and in

sections of the southeastern part of the country it was colder than any month during the past winter. The greatest departures above the average March temperature were noted in eastern Nova Scotia, where they exceeded 4°, and the most marked departures below the average temperature were reported in Illinois and in the British Possessions north of Montana, where they equalled or exceeded 5°. At stations in central Illinois and southeastern Iowa the mean temperature was as low or lower than previously reported for March. At stations in the Atlantic coast and west Gulf states, and over the southeastern slope of the Rocky Mountains the maximum temperature was as high or higher than reported for March of preceding years, and at stations in the south Atlantic states, the Florida Peninsula, the Gulf States, Tennessee, the upper Mississippi and Missouri valleys, the southeastern slope of the Rocky Mountains, the plateau regions, and along the north Pacific coast the minimum temperature was as low or lower than previously reported for March, and in the Atlantic coast states from New England southward, and in the Gulf States the minimum temperature was lower than at any time during the past winter. The cold waves which swept over the southern and southeastern states during the first and middle parts of the month, which were of unprecedented seasonal severity throughout a greater part of this area, were attended by heavy frost throughout the southern tier of states from Texas eastward to the Atlantic coast, which caused considerable damage to growing crops, fruit blooms, and young fruit trees, and light frost was reported as far south as Lee county, Fla., the extreme southern limit of frost ever reported for any month. On the 12th heavy frost injured fruit in the valley of the Gila River, Arizona. The killing frosts of the middle of the month were four to six weeks later in Florida, and one to two weeks later in the southern parts of the east Gulf states, while in the Carolinas the heavy frosts of the middle of the month, and in the Gulf States the killing frost of the first part of the month about corresponded with the average dates of last killing frosts in those regions.

The heaviest monthly precipitation reported was 19.83 inches at Sims, Shasta Co., Cal., and the precipitation exceeded fifteen inches in parts of Humboldt county, Cal., at South Fork, Ky., and Marengo, Ind. In the southwestern part of the southern plateau region, southeastern Arizona, southwestern and southeastern New Mexico, a greater part of southwestern Texas,

within an area extending from the Panhandle of Texas northward over western Kansas, and in north-central Kansas no precipitation was reported. The precipitation was generally in excess of the average for the month from the west Gulf states northward over the upper Mississippi valley and north-eastward over the Ohio Valley, the middle Atlantic states, and New England, over the northeastern slope of the Rocky Mountains, the middle and northern plateau regions, and along the middle and north Pacific coasts; elsewhere the precipitation was deficient. The greatest excesses in precipitation occurred in the northern plateau region, where more than double the usual amount of precipitation was reported, and in New England, the Ohio Valley, Tennessee, the middle plateau region, and the middle Pacific coast, where the precipitation was about 50 per cent. greater than the March average. In the Rio Grande Valley, and over the middle-eastern slope of the Rocky Mountains about one-eighth of the usual amount of precipitation fell: over the southeastern slope of the Rocky Mountains, and on the south Pacific coast about one-fourth; and in the south Atlantic and east Gulf states, and over the southern plateau region about one-half the usual precipitation for March was reported. At stations in New England, the middle Atlantic and west Gulf states, the Ohio Valley and Tennessee, Nebraska, Idaho, and Washington the precipitation was the heaviest, while at stations in Alabama, Kansas, Nebraska, Indian Territory, New Mexico, extreme western Texas, and south-central California the precipitation was the least ever reported for March. The heaviest snowfall of the month was reported along the line of the Central Pacific Railroad in Nevada and Placer counties, Cal., where it amounted to about one hundred and forty inches. The snowfall was heavier than for any month during the past winter in parts of the central Mississippi valley and lower Michigan, and on the 2d the heaviest snow storm since the establishment of the Signal Service station in 1871 occurred at Charleston, S. C.

Unusually brilliant and well-defined solar halos and parhelia were reported on the 2d in parts of New York, Mississippi, Louisiana, Arkansas, Alabama, Wisconsin, and North Dakota, and remarkable lunar halos were noted in Tennessee on the 2d and 3d. A long and protracted drought was reported in the lower Rio Grande valley. Many cattle were dying from thirst, early crops were retarded, and the Rio Grande River was at the lowest stage ever known at Brownsville, Tex.

ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for March, 1890, as determined from observations taken daily at 8 a. m. and 8 p. m. (75th meridian time), is shown on chart ii by isobars. The departure of the mean pressure for March, 1890, obtained from observations taken twice daily at the hours named from that determined from hourly observations, varied at the stations named below, as follows:

Station.	Departure.	Station.	Departure.
Eastport, Me.	+ .063	Saint Paul, Minn.	+ .002
Boston, Mass.	+ .010	Cincinnati, Ohio.	+ .001
New York City.	+ .012	Memphis, Tenn.	— .002
Philadelphia, Pa.	+ .013	Galveston, Tex.	— .007
Washington City.	+ .013	Dodge City, Kans.	— .013
Savannah, Ga.	+ .008	Santa Fe, N. Mex.	— .015
Buffalo, N. Y.	+ .007	Denver, Colo.	— .004
Detroit, Mich.	+ .007	Salt Lake City, Utah.	— .013
Saint Louis, Mo.	+ .004	San Francisco, Cal.	— .015
Chicago, Ill.	+ .005	San Diego, Cal.	— .019

For March, 1890, the mean pressure was highest over northeastern Florida and the more southern part of the south Atlantic states, where it rose above 30.15, the highest mean reading, 30.16, being noted at Augusta, Ga., and at Jacksonville and Titusville, Fla. The mean pressure was above 30.10 from the east Gulf and south Atlantic coasts northwestward

to Manitoba, and on the middle California coast. The mean pressure was lowest over the Canadian Maritime Provinces, where it fell below 29.90, and at Charlottetown, P. E. I., a mean reading of 29.84 was noted. Over a greater part of New England and the Saint Lawrence Valley, over the southwestern and extreme southeastern parts of the plateau region, on the extreme north Pacific coast, and from the British Possessions north of western Montana southeastward to central Colorado the mean values were below 30.00.

A comparison of the pressure chart for March, 1890, with that of the preceding month, shows that there has been a general increase of pressure from the upper lake region southward over the Ohio and Mississippi valleys, along the immediate Pacific coast, and from Oregon and northern California southeastward to northwestern New Mexico; elsewhere there has been a decrease in pressure. The increase in pressure in the districts named was generally less than .05, while in extreme eastern New England, Nova Scotia, and New Brunswick, and in north-central Montana and the British Possessions to the northward the decrease in pressure was more than .15. The area of high pressure which occupied the south Atlantic coast in February has contracted to the southward with slight changes in included values; the area of high pressure which extended northward and northwestward from the lower Mis-

souri valley in February has disappeared; slight changes in mean pressure have occurred along the Pacific coast; areas of low pressure have appeared over the Canadian Maritime Provinces and over the northeastern and middle-eastern slopes of the Rocky Mountains, where the most marked decrease in pressure occurred; and there has been a decrease in pressure of .05 to .06 in the western part of the southern plateau region.

The mean pressure was above the normal, except on the north Pacific coast, over the northeastern and southeastern slopes of the Rocky Mountains, over a greater part of Texas, and in upper Michigan. The departures above the normal pressure equalled or exceeded .05 from the upper Mississippi and lower Missouri valleys to the Atlantic coast south of the fortieth parallel, at stations in the lower lake region, and at Red Bluff, Cal. In central Montana and the British Possessions to the northward the departures below the normal pressure were more than .05, while in Texas, on the north Pacific coast, and in upper Michigan the mean pressure varied from .01 to .03 below the normal.

BAROMETRIC RANGES.

The monthly barometric ranges at the several Signal Service stations are shown in the table of miscellaneous meteorological data. The general rule, to which the monthly barometric ranges over the United States are found to conform, is that they increase with the latitude and decrease slightly, though somewhat irregularly, with increasing longitude. In March, 1890, the monthly ranges were greatest over north-central Kansas, where they exceeded 1.50, whence they decreased irregularly eastward to western New England, where they were less than 1.10, and thence increased to more than 1.30 in extreme eastern Maine and southeastern Massachusetts. From Kansas the monthly ranges decreased southeastward to less than .40 over southern Florida; southward to less than 1.00 over eastern Texas, and to more than 1.10 in the lower Rio Grande valley; southwestward to less than .60 in southeastern Arizona and on the south Pacific coast; irregularly westward to the middle Pacific coast, where they varied from .70 to 1.00; northwestward to southern Nevada, where they were less than .80, whence they increased to more than 1.30 in central and northwestern Washington; and northward to less than 1.15 in eastern South Dakota, whence they increased to more than 1.20 over northern North Dakota. Along the Atlantic coast the monthly ranges varied from .37 at Key West, Fla., to 1.38 at Eastport, Me.; between the eighty-second and ninety-second meridians, .36 at Tampa, Fla., and .49 at Cedar Keys, Fla., to 1.40 at Saint Louis, Mo.; between the Mississippi River and the Rocky Mountains, .91 at Galveston, Tex., to 1.52 at Concordia, Kans.; in the Rocky Mountain and plateau regions, .56 at Fort Grant, Ariz., to 1.35 at Walla Walla, Wash.; on the Pacific coast, .52 at San Diego, Cal., to 1.37 at Port Angeles, Wash.

Chart ii shows that in March, 1890, there was a range in mean pressure of .32 from the Gulf of Saint Lawrence to the south Atlantic coast; a range of .30 from the Gulf of Saint Lawrence to the middle Missouri valley; a range of less than .20 from the middle Missouri valley to the northeastern slope of the Rocky Mountains, and to the western part of the middle plateau region; and a range in monthly mean pressure of but .15 from the north Pacific coast to the middle Missouri valley.

AREAS OF HIGH PRESSURE.

Nine areas of high pressure were observed within the limits of the United States: four of which were first observed on the Pacific coast; four were traced from the region north of Montana; while the fifth, which covered the Rocky Mountain region on the 1st, was traced southeastward to Florida. Those observed on the Pacific coast apparently moved to the northeast until passing to the east of the coast line, after which the direction of movement was to the southeast. The mean track of the areas of high pressure for the month is considerably to the south of that of the previous month, the centre of greatest pressure of five of these areas passing eastward over the Mississippi Valley south of the fortieth parallel, while only one

reached the Atlantic coast from the regions north of the fortieth parallel. The direction of movement over the eastern slope of the Rocky Mountains was to the south of east; those appearing to the north of Montana and North Dakota moving more directly to the southward, while those passing eastward over the central Rocky Mountain region passed slightly to the south of east. The direction of movement while passing over the region east of the Mississippi was to the southeast in three cases where the areas passed over the Southern States, and to the east in the cases where the areas reached the Atlantic over the Ohio Valley and Lake region.

The following is a general description of the weather conditions attending the movement of these areas over the field of observation:

I.—At the opening of the month the pressure was unusually high over the western half of the continent, attended by clear and cold weather, while the conditions were unsettled on the Atlantic coast, attended by snow and rain from Florida northward to New England. On the morning of the 1st the pressure was greatest over Utah, and on the morning of the 2d, while the pressure continued greatest in that section, it had declined two-tenths of an inch, and a portion of the area of high pressure had passed to the eastward over the lower Mississippi valley, this portion of the area being central over Arkansas and covering the central valleys and Gulf States. It passed southeastward over the east Gulf states and Florida during the 2d and 3d, attended by killing frosts as far south as central Florida and along the east Gulf coast, the temperature falling lower than previously recorded at any time during the winter in Florida and generally throughout the south Atlantic and east Gulf states. After reaching the northern portion of the east Gulf states the movement was to the southward until the centre reached the west Florida coast, and this movement caused a continuation of the northwest winds over northern Florida, and these winds, being relatively dry and light during the passage of the area over this region, were attended by conditions most favorable to the occurrence of damaging frosts. During the 4th the direction of movement was eastward over Florida, and by the morning of the 5th it had passed over the Atlantic beyond the limits of observation.

II.—This area of high pressure appeared north of Montana on the 3d, and it is the only one observed during the month which passed eastward north of the Lake region. It moved slowly from the region north of Montana to the region north of Lake Huron during the 3d, 4th, and 5th, the centre being located far to the north of the stations of observation while the area extended southward, covering the greater portion of the country east of the Rocky Mountains. After the centre reached the vicinity of Lake Huron on the 2d a westerly movement occurred, which carried the centre to southern Wisconsin on the 8th, after which the easterly movement was resumed, the centre passing over Lake Huron to the upper Saint Lawrence valley, where it was observed on the morning of the 9th, the area at that time covering the entire country east of the Mississippi. After reaching the upper Saint Lawrence valley the direction of movement was again changed, the area passing almost directly southward over the middle Atlantic states. It passed off the middle Atlantic coast during the 10th, and apparently moved in a southeasterly course after leaving the coast line. Reports from the stations on the south Atlantic coast during the 11th and 12th indicate a slow southerly movement of this area over the Atlantic during those dates, and its presence in that region was evident from the reports as late as the 13th.

III and IV.—First appeared over the Pacific west of California on the 10th, when it apparently moved in a northeasterly direction, the telegraphic reports on the 9th indicating the approach of this area of high pressure. It moved northward along the coast during the 10th and 11th, attended by frosts as far south as southern California, and extending eastward over the plateau regions to the Rocky Mountains. After reaching the north Pacific coast the direction of movement

changed to the southeast on the 12th, and it moved to the central Rocky Mountain region by the 14th, when it included within its limits the greater portion of the country west of the Mississippi. After the centre reached the southern portion of Colorado it apparently moved westward to Utah on the 15th, after which it could be no longer traced, as it became a part of high area iv, which appeared north of Montana on the 13th, when the preceding area covered the central Rocky Mountain region. Number iv passed southeastward to Manitoba, and afterwards almost directly southward to the lower Missouri valley, where it was central on the 15th, and included within its limits the central valleys, extending from the Rocky Mountains to the Atlantic coast. The southerly course continued over the Gulf States, the centre passing to the west of the east Florida coast, causing continued northwest winds, which were attended by killing frosts in northern Florida on the night of the 16th, and light frosts as far south as Point Jupiter. Although the barometric pressure diminished during the transit of this area over the south Atlantic states, its southeast course continued, and reports on the 18th indicate that it was central to the southeast of Florida on that date.

V.—This area of high pressure also appeared to the north of Montana, where it was observed on the 18th as an area of slight intensity and not clearly defined. It moved southeastward over the Missouri Valley, causing no unusual disturbance in the weather conditions, and thence eastward to the Atlantic coast, where it disappeared to the eastward during the 20th.

VI.—Was observed approaching from the Pacific to the west of northern California on the morning of the 20th. It probably reached the coast line during the night of that date, after which it passed eastward over the plateau and central Rocky Mountain regions, the movement being almost directly eastward, the centre reaching the lower Missouri valley on the 22d, when this area included within its limits the entire eastern slope of the Rocky Mountains and also the central valleys. Although this area was well defined during its entire course the pressure was not unusually high, but its movements were distinctly marked by the regular telegraphic reports. It passed eastward along the fortieth parallel from the Pacific to the Atlantic in four days, with almost a uniform velocity, leaving the middle Atlantic coast on the 25th.

VII.—This area of high pressure also appeared on the Pacific coast, it being central to the west of Oregon on the 23d. It passed eastward over the state of Washington on the 24th and thence to the Saskatchewan Valley where it was central on the 25th, the southern half of this area extending southward, including within its limits the entire Rocky Mountain regions within the United States. It moved southeastward over the Missouri Valley during the 25th, decreasing in energy, and disappeared while central over Iowa, by a decrease of pressure, in advance of a severe storm which then existed in the central Rocky Mountain region.

VIII.—Appeared on the north California coast on the 26th, when a well-marked area of low pressure covered the northern and central plateau regions. It passed over northern California during the night of the 26th, and thence southeastward over the central plateau and southern Rocky Mountain regions, reaching northern Texas on the morning of the 28th and the lower Mississippi valley on the morning of the 29th, the barometric pressure near the centre remaining near 30.30 inches during its passage from the Pacific coast. It reached the south Atlantic states on the 29th, after which it could be no longer traced, owing to the decrease of pressure.

IX.—Appeared north of Montana during the 28th, and although it moved slowly to the eastward it continued in that region until the afternoon of the 30th, after which date it moved southward to Minnesota, where it was central at the close of the month.

AREAS OF LOW PRESSURE.

Twelve areas of low pressure were observed within the

limits of the United States during the month of March: six of which first appeared on the north Pacific coast; three apparently developed in the Rio Grande Valley or the central Rocky Mountain region; one in the east Gulf states; one off the south Atlantic coast; and one north of Montana. Six of the depressions observed reached the Atlantic coast north of Hatteras, two passed over the Saint Lawrence Valley, and two passed northeastward over the upper lake region. The direction of these disturbances was generally to the northeast when the centre was east of the Mississippi Valley, those moving over the lower latitudes inclining more to the northward as they approached or passed along the Atlantic coast. With one exception, all areas traced across the Rocky Mountains moved to the south of east in that region, and the change of direction from southeast to northeast generally occurred near the one hundredth meridian. The following is a general description of the more important weather conditions attending the movement of each area of low pressure:

I.—On the afternoon of the 1st this disturbance appeared far to the north of Montana, and reports indicate it may have had its origin to the west of the Rocky Mountains. It passed rapidly eastward north of the stations of observation, reaching the vicinity of Lake Superior on the morning of the 3d, and after apparently moving southward over Lake Michigan it passed eastward, following the course of the Saint Lawrence Valley, during the 4th and 5th, attended by snows throughout the Lake region, the middle Atlantic states, and New England. The pressure at the centre increased during the easterly movement over the Lake region, and it probably disappeared by increase of pressure before reaching the Atlantic.

II.—Probably developed off the south Atlantic coast during the 1st. Its centre was first located on chart i in the vicinity of Cape Hatteras on the morning of the 2d, northerly gales having occurred at that station during the preceding night. It moved rapidly along the Atlantic coast, following the general course of the Gulf Stream until it reached the fortieth parallel, passing near the southeast coast of New England during the night of the 2d, causing severe northeasterly gales and general snows along the coast from Norfolk to Nova Scotia. This storm continued to increase in intensity until the centre of disturbance passed to the north of the forty-fifth parallel near Eastport, Me., after which the area of disturbance increased rapidly, with a corresponding decrease in energy.

III.—This disturbance was first observed in the eastern Gulf states, and it was located in the eastern extremity of a trough of low pressure which extended westward to the Rio Grande Valley and thence northward over the Rocky Mountain districts, bounding the south and west quadrants of the area of high pressure which was at that time central near Lake Superior and covering the greater portion of the country east of the Rocky Mountains. The southerly movement of this area of high pressure apparently forced this disturbance rapidly to the northeastward, and after reaching the middle Atlantic coast on the 6th it developed considerable energy, causing strong gales along the New England and middle Atlantic coasts. It followed the same general course as the preceding storm, and was most severe on the New England coast, although the maximum wind velocities were somewhat less than those reported in the preceding storm. It was last noted as central near the coast of Newfoundland, and reports indicate that it became greatly extended and less severe after it left the Maritime Provinces.

IV and V.—Although this disturbance (number iv) did not reach the eastern portion of the United States, it was attended by strong southerly gales on the north Pacific coast on the 7th and 8th. The barometric pressure was unusually low on the west coast during the 6th and 7th, and this area of low pressure moved eastward to the plateau regions and disappeared, being apparently forced westward by an extended high area then to the eastward, and after this pressure gave way the low area traced as number iv passed to the east of the coast line and thence north of Montana, where it disappeared after the 10th,

leaving, however, in the southern extremity of the barometric trough which attended it, the disturbance traced as number v. This last area of low pressure was located in Colorado on the afternoon of the 9th, and after being forced southward over New Mexico it passed rapidly northeastward over the central Mississippi valley and upper lake region as an extended rain area covering the country east of the Rocky Mountains, except the upper Missouri valley. These rains were especially heavy in the lower Mississippi and the Ohio valleys. After passing to the north of Lake Huron this disturbance became so faintly defined as to render it impossible to locate its centre, but the telegraphic reports indicate that it probably drifted to the eastward over the lower Saint Lawrence valley without causing any marked disturbance.

VI.—Apparently developed in the lower Rio Grande valley during the 11th. It passed eastward over the west Gulf in advance of an area of high pressure which covered the central Rocky Mountain regions, and after the winds shifted to northerly on the west Gulf coast a maximum velocity of 42 miles occurred at Galveston. The track of this disturbance is only approximately given over the Gulf, and it is possible that within the trough of low pressure which was apparently being forced eastward by the high pressure a new centre of disturbance developed in the south Atlantic states on the 14th. As in the case of low areas ii and iii, this disturbance passed to the northeastward near Cape Hatteras, afterward following the general course of the Gulf Stream until the centre reached the vicinity of southern Nova Scotia, the winds increasing in force during the northerly movement. This storm differs from those previously referred to from the fact that it continued to increase in energy after passing over the Maritime Provinces. The minimum barometric pressure observed was 28.62, on the 17th, when the centre was near Anticosti Island, Gulf of Saint Lawrence. Although the area of the storm apparently increased, the gales became more severe and continued until the 18th, when the course of the storm apparently changed to the eastward.

VII.—This storm appeared on the north Pacific coast north of the state of Washington on the 15th. It moved directly southeast, crossing over Montana and Wyoming on the 16th; Colorado and Indian Territory on the 17th and 18th, reaching Arkansas on the afternoon of the 18th, where its course changed to the north of east. On the afternoon of the 18th an extended barometric depression covered the lower Mississippi and Ohio valleys. The general form of this depression was elliptical, and it extended from Virginia to western Texas. During the night of the 18th this entire depression was replaced by an area of high pressure, and the centre of barometric pressure was transferred rapidly to eastern Virginia, and a disturbance of considerable energy developed quickly and passed rapidly off the coast, attended by severe gales and snow along the southern New England and middle Atlantic coasts. This storm apparently passed over the Atlantic, inclining to the northeastward as it approached Nova Scotia.

VIII.—Appeared off the north Pacific coast on the 17th, and although this storm was at no time central within the limits of the United States, from the regular telegraphic reports it has been traced across the continent, the centre of disturbance following approximately the fiftieth parallel of latitude, being slightly to the north of this parallel over the western half of its course, and slightly to the south of it over the eastern half. The transit was made in four days. The barometric pressure was unusually low along the line of this disturbance, and when the centre reached the vicinity of the Lake region the southern half of the disturbance covered the Northern States, over which general rains occurred on the 20th and 21st of the month.

IX.—This storm developed in Texas on the 21st, in the southern portion of a barometric trough which at that time extended northward over the upper lake region, where the storm previously described was central. Previous to the development of this storm southerly gales were reported on the west Gulf coast and high westerly winds from the interior of Texas, New Mexico, and Arizona. When central in eastern Texas a

norther occurred in the upper Rio Grande valley, attended by snow and freezing weather. This storm moved northeastward over Arkansas, Tennessee, and Kentucky during the twenty-four hours following its development, and during the 22d it passed over the middle Atlantic states and southern New England, attended by general rains and high winds. It apparently increased in energy after passing to the east of New England, and the minimum barometric pressure observed during its passage occurred at Sydney, C. B. I., on the 23d, when the centre was near and to the east of that station.

X.—Was central on the north Pacific coast north of the state of Washington on the 22d. It passed southeastward, crossing the Rocky Mountains on the 23d, and reached the Missouri Valley near Yankton, S. Dak., on the morning of the 24th. At this point the direction of movement changed to the northeast and the storm passed over the upper lake region, attended by severe gales and light snows in the Lake region and high winds on the Atlantic coast north of Hatteras, N. C. The course changed to eastward after reaching the vicinity of Lake Huron, and the disturbance passed eastward, crossing the Saint Lawrence Valley near Quebec, the centre being near the northern boundary of Maine on the afternoon of the 26th, after which it apparently moved northeastward.

XI.—This storm was the most marked disturbance which occurred during the month. It probably had its origin over the Pacific, while the depression was first observed to the west of the state of Washington on the 25th. It passed to the east of the coast line on that date, and thence rapidly southeastward to the central Rocky Mountain region, where it was central on the afternoon of the 26th. The low barometric readings observed within the limits of this disturbance, and the unusual energy developed as evinced by high wind velocities reported, attracted the attention of this office, and the threatening conditions caused the Chief Signal Officer to announce the danger by the issue of the following special bulletin on the morning of the 26th, when this storm was central in Kansas, and some hours before the occurrence of the tornadoes which were so destructive both to life and property:

WASHINGTON CITY, March 27, 1890—1 p. m.

At 8 o'clock this morning a severe storm was central in eastern Kansas, with velocities on the eastern side of thirty-six miles, southeast, at Saint Louis; on the southern side of forty-eight miles, west, in northern Texas; on the western side of sixty miles, north, in Colorado; and on the northern side of thirty-six miles, north, in Nebraska and South Dakota, with a severe blizzard and snow in Nebraska. Warnings were sent out this morning for severe local storms in the states of Ohio, Indiana, Illinois, Tennessee, Kentucky, Georgia, and Alabama, and for a severe norther extending from Kansas to northern Texas to-night and to-morrow morning. At noon the storm had moved eastward so as to cover all of Illinois, with high winds; Chicago reporting forty miles, east, and increasing. The storm will be felt on the Atlantic coast to-night or to-morrow morning, producing severe local storms in the interior, easterly gales on the coast from Hatteras to Maine, and high southwest winds on the south Atlantic coast.

These tornadoes occurred in the southeast quadrant of this disturbance, probably two hundred miles from the centre, when the storm was moving over Illinois and Indiana. Although numerous tornadoes are reported, the most destructive occurred at Louisville, relative to which the Signal Service observer at that station has prepared a special report, which is published herewith under the head of "Local storms." This barometric disturbance continued its course eastward, passing over the lower lake region and New England, reaching the New England coast on the 28th, after which it passed northeastward over Nova Scotia, its centre being last located northeast of, and near to, Sydney, C. B. I., on the 29th.

XII.—This depression covered the central plateau region on the 29th, and moved southeastward over Utah and New Mexico, apparently being forced southward by an area of high pressure which was at that time moving southward over the eastern slope of the Rocky Mountains. At the close of the month this disturbance was central over northern Mexico, the pressure being low in the Rio Grande Valley and over the southern plateau regions.

TABLE I.

Barometer.	First observed.			Last observed.			Duration.	Velocity per hour.	Maximum abnormal changes in pressure in twelve hours, with maximum abnormal changes in temperature and maximum wind velocities in connection therewith.										
	Date.	Lat. N.	Long. W.	Lat. N.	Long. W.	Rise.			Station.	Date.	Fall.	Station.	Date.	Miles per hour.	Direction.	Station.	Date.		
High areas.		°	°	°	°	Days.	Miles.	Inch.											
I.....	1	41	108	39	80	3-5	24	.42	Parry Sound, Ont.....	1	26	Raleigh, N. C.....	1	48	n.	Key West, Fla.....	2		
II.....	3	55	109	35	72	7-5	14	.48	Calgary, N. W. T.....	3	23	Bismarck, N. Dak.....	3	56	n.	Hatteras, N. C.....	8		
III.....	10	40	127	40	110	5-0	19	.32	Fort Canby, Wash.....	10	26	Calgary, N. W. T.....	10	44	e.	Fort Grant, Ariz.....	16		
IV.....	13	54	107	37	80	4-5	25	.35	Fort Sully, S. Dak.....	14	28	Des Moines, Iowa.....	14	52	nw.	Hatteras, N. C.....	14		
V.....	15	34	109	39	75	3-0	55	.48	Washington City.....	19	18	Lynchburgh, Va.....	19	36	nw.	Bismarck, N. Dak.....	16		
VI.....	20	41	128	43	60	5-5	35	.58	Lynchburgh, Va.....	23	33	Fort Grant, Ariz.....	20	48	nw.	Fort Custer, Mont.....	21		
VII.....	23	43	127	43	95	3-0	35	.44	Montrose, Colo.....	24	15	Helena, Mont.....	23	60	nw.	Fort Buford, N. Dak.....	24		
VIII.....	26	37	126	33	83	3-5	35	.82	Concordia, Kans.....	27	29	Salt Lake City, Utah.....	26	68	nw.	Fort Elliott, Tex.....	27		
IX.....	28	54	117	45	97	3-5	14	.36	Denver, Colo.....	31	31	Palestine, Tex.....	31	42	nw.	Fort Sill, Ind. T.....	27		
																	Bismarck, N. Dak.....	28	
Mean.....		47	118	37	84	4-2	27	.47			25			50					
Low areas.									Fall.			Rise.							
I.....	1	53	108	43	66	4-0	23	.66	Qu'Appelle, N. W. T.....	1	29	Valentine, Nebr.....	2	34	w.	Buffalo, N. Y.....	4		
II.....	2	35	73	49	61	1-5	40	.48	Eastport, Me.....	3	10	Yarmouth, N. S.....	3	56	n.	Block Island, R. I.....	3		
III.....	5	33	86	50	58	1-5	54	.46	Anticosti Island, G. of S. L.....	7	11	Jacksonville, Fla.....	5	44	ne.	.....do.....	6		
IV.....	8	47	128	50	102	3-0	31	.50	Fort Buford, N. Dak.....	8	33	Mobile, Ala.....	10	60	se.	Fort Canby, Wash.....	8		
V.....	9	40	104	47	80	3-0	43	.36	Des Moines, Iowa.....	9	23	Leavenworth, Kans.....	10	48	w.	El Paso, Tex.....	10		
VI.....	11	26	101	51	60	6-5	22	.44	Anticosti Island, G. of S. L.....	16	14	Montreal, Quebec.....	17	48	sw.	Montreal, Quebec.....	17		
VII.....	15	52	119	42	67	4-5	44	.62	Chatham, N. B.....	15	27	Fort Buford, N. Dak.....	15	60	ne.	Block Island, R. I.....	19		
VIII.....	17	46	128	48	67	4-0	33	.52	Minnedosa, Man.....	19	26	Saint Vincent, Minn.....	19	46	w.	Denver, Colo.....	19		
IX.....	21	31	100	45	59	2-5	50	.40	Anticosti Island, G. of S. L.....	21	23	Atlanta, Ga.....	21	46	w.	Anticosti, Gulf of St. L.....	23		
X.....	22	50	122	49	57	4-5	34	.70	Block Island, R. I.....	26	22	Fort Sully, S. Dak.....	23	52	s.	Dodge City, Kans.....	23		
XI.....	25	49	130	47	58	4-5	41	.70	Indianapolis, Ind.....	27	22	Norfolk, Va.....	28	68	se.	Fort Elliott, Tex.....	27		
XII.....	29	43	120	30	107	2-5	25	.26	Montrose, Colo.....	30	16	El Paso, Tex.....	29	44	s.	Chicago, Ill.....	27		
																	Brownsville, Tex.....	31	
Mean.....		42	110	46	70	3-3	37	.50			21			51					

NORTH ATLANTIC STORMS FOR MARCH, 1890 (pressure in inches and millimetres; wind-force by Beaufort scale).

The paths of the depressions that appeared over the north Atlantic Ocean during March, 1890, are shown on chart i. These paths have been determined from international simultaneous observations by captains of ocean steamships and sailing vessels received through the co-operation of the Hydrographic Office, Navy Department, and the "New York Herald Weather Service."

Ten depressions have been traced for March, 1890, the average number traced for the corresponding month of the last seven years being 9.4. The greatest number of depressions previously traced for March was twelve, in 1889, and the least number was seven, in 1883 and 1888. Of the depressions traced for the current month six advanced eastward over Newfoundland, one apparently developed near Bermuda, one was central southwest of the Azores during the first four days of the month, and two first appeared over mid-ocean east of the thirtieth meridian. One depression advanced from the middle Atlantic coast, where it was central on the morning of the 19th, to the British Isles by the 22d; the remaining depressions which advanced eastward from American waters passed north of the region of observation before reaching the European coast. Over the western part of the ocean the severer storms of the month occurred on the 2d, 3d, 8th to 10th, 17th, 19th, 20th, and 28th. Over mid-ocean, along and north of the trans-Atlantic steamship routes, generally settled weather prevailed until the 10th, after which date there were marked fluctuations in barometric pressure, with gales of varying force, until the close of the month, the 15th, 23d, and 25th being marked by storms of considerable strength. Over the eastern part of the ocean, north of the fiftieth parallel, the pressure was prevailingly low from the 4th to 27th. At noon, Greenwich time, of the 16th, the barometer had fallen to 29.08 (739) at Leith, Scotland; on the 15th a reading of 29.15 (740), was reported at Valentia, Ireland; and on the 24th the pressure was below 29.00 (737) northwest of the British Isles. The 7th, 8th, 14th, 17th, 18th, 25th, and

26th were also marked by very low barometric pressure over and near the British Isles.

Mr. B. Cecil, Director General of Telegraph, at Tegucigalpa, Honduras, has made the following report: "On the 1st, at about 4 p. m., a severe hurricane passed over the north coast of Honduras from the northeast. All banana plantations along the line of the hurricane were ruined; houses, etc., were blown down, but no lives were lost. The weather was very cold and rainy, and in Truxillo very heavy winds prevailed. The telegraph line which had just been finished will have to be rebuilt."

Compared with the corresponding month of the last seven years, the depressions traced for March, 1890, while exceeding in number the March average, were not attended by storms of exceptional violence; storms of marked severity were not reported east of the fortieth meridian, and the more violent storms of the month were reported off the coast of the United States on the 2d, over and south of the Canadian Maritime Provinces on the 3d, northeast of Bermuda on the 9th, over and near Newfoundland and the Grand Banks on the 17th, off the American coast north of Cape Hatteras on the 19th, over Newfoundland and the Grand Banks on the 20th, and over and west of the Grand Banks on the 28th. Among the more notable storms of March of preceding years was that of March 11-14th, 1888. This was the most violent storm over the eastern part of the country in a number of years, and was remarkable not only for the abnormal course it pursued and the strength of its attending gales, but also for the heavy precipitation, more especially the heavy snowfall in New England and the more northern part of the middle Atlantic states, the marked and sudden changes in temperature, and the steep barometric gradient noted while the storm was central over and south of southern New England. A detailed description of this storm is given in the MONTHLY WEATHER REVIEW for March, 1888.

The movements of areas of high pressure over the north Atlantic Ocean during the month were as follows: On the 1st an area of high pressure extended from east of the Grand Banks

to the Bay of Biscay; by the 2d this area of high pressure had extended westward over the Grand Banks and southward to the fortieth parallel; during the 3d the pressure increased over and near Newfoundland, and by the 4th this area was joined by an area of high pressure which had advanced eastward from the Lake region. On the 4th an area of high pressure, which had advanced from the Gulf States, was central over Florida and southern Georgia, whence it moved off the coast and on the 5th extended from the Bahamas northeastward to the fortieth parallel, on which latter date the area of high pressure, central on the 4th over the Canadian Maritime Provinces, was central over mid-ocean north of the Azores. By the 6th the area of high pressure, central on the preceding date off the American coast, had moved northeastward and united with the area of high pressure over mid-ocean, and the pressure was high from the Canadian Maritime Provinces to the European coast south of the fiftieth parallel. By the 7th this area had apparently contracted westward and occupied the ocean between Newfoundland and the Azores, and by the 8th had moved southeast and was central over the Azores, where it remained nearly stationary during the 9th and 10th. On the 10th an area of high pressure, which had advanced from the Lake region, was central off the middle Atlantic coast, whence it extended northward and eastward during the 11th and 12th, moved east and southeast during the 13th, and on the 14th occupied a limited area southwest of the Azores, in which region it apparently remained nearly stationary until the 19th. On the 17th an area of high pressure was central over Florida, whence it had advanced from the middle and lower Mississippi valleys; on the 18th this area was central over the Bahamas, after which it apparently disappeared by a decrease in pressure. On the 24th an area of high pressure, which had advanced from the Lake region, extended from the lower lakes southward to the twenty-fifth parallel; by the 25th this area had extended eastward south of the Grand Banks; by the 26th it occupied an area extending from Newfoundland southward and southeastward; by the 27th it occupied a small area east of the Grand Banks, and by the 28th had apparently moved southeastward over the Azores. On the 30th an area of high pressure, which had advanced from the lower Mississippi valley, was central over and east of Florida, whence it extended northward along the coast and eastward over the ocean by the 31st.

The following are brief descriptions of the depressions traced for March, 1890:

1.—During the first four days of the month a well-defined cyclonic area was central west-southwest and southwest of the Azores, although its centre could be approximately located on the 1st and 2d, only, after which it apparently moved southeastward. During this period barometric pressure falling to about 29.60 (752), and moderate to fresh gales were reported in that region. During the prevalence of this depression an area of high pressure occupied the ocean to the north and northeast of its position, which fact apparently prevented the storm from pursuing the usual northeasterly course.

2.—This depression was a continuation of low area iii, which was central on the middle Atlantic coast on the 6th and over Nova Scotia on the morning of the 7th. The depression moved northeast over Newfoundland by the morning of the 8th, after which it recurved to the east of the Grand Banks by the morning of the 9th, and by the 10th had apparently united with depression number 4 which had advanced from near Bermuda. The storm increased in energy during the 8th and 9th, when fresh to strong gales prevailed over and near the Grand Banks.

3.—This depression was first located east of Bermuda by reports of the 8th, and by the morning of the 9th had moved northeastward to about N. 36°, W. 58°. By the morning of the 10th the centre of depression had moved to the east of the Grand Banks, after which it passed northeastward and disappeared north of the region of observation. This depression developed great energy on the 9th, when pressure falling to about 29.45 (748) and gales of hurricane force were reported

north and northeast of Bermuda, and on the 10th, when the central pressure was as low or lower than on the preceding date and fresh to strong gales were reported over and near the Grand Banks.

4.—During the 13th and 14th the pressure was low and falling west of the British Isles, and on the latter-named date the readings were below 29.00 (737) along the trans-Atlantic steamship tracks near the twentieth meridian. Reports at hand will not, however, admit of locating the storm-centre until the 15th, on which date the centre of disturbance was in about N. 54°, W. 23°. At noon, Greenwich time, of the 16th the depression had advanced to the British Isles, whence it moved eastward and disappeared over the North Sea by the 17th. This depression was attended by pressure falling to or below 29.00 (737) throughout, but reports do not indicate that it was accompanied by storms of marked violence.

5.—This depression was the continuation of low area vi, which was central over New Brunswick on the morning of the 16th. On the morning of the 17th the depression was central over northern Newfoundland, after which it passed north of the region of observation. On the 17th the pressure fell below 29.20 (742) south of Newfoundland and Nova Scotia, and strong to whole gales were reported in that region, and on the 18th and 19th fresh to strong westerly gales continued over and east of the Grand Banks.

6.—This depression was a continuation of low area vii, which passed northeastward from the middle Atlantic coast during the 19th. On the morning of the 20th the depression was central south of Newfoundland, whence it moved rapidly east-northeast to about the twenty-eighth meridian by the 21st, after which it apparently passed north of the British Isles. On the 19th this depression was attended by pressure falling to about 29.10 (739) and gales of hurricane force south of Nova Scotia, and on the 20th by pressure falling to about 29.20 (742) and strong to whole gales over the Grand Banks, after which there was an apparent decrease in energy.

7.—This depression was a continuation of low area ix, which moved northeastward from the middle Atlantic coast during the 22d. On the morning of the 23d the depression was central east of Cape Breton Island, whence it passed northeastward to the forty-fifth meridian by the 24th, and advanced thence east-northeast to the twenty-fifth meridian by the 25th, after which it disappeared north of the region of observation. This depression was attended by fresh to strong gales throughout, and on the 25th, when central west of the British Isles, barometric pressure falling below 29.00 (737) was indicated, and the pressure continued very low between the fifty-fifth parallel and Iceland during the 26th and 27th.

8.—This depression first appeared over mid-ocean north of the trans-Atlantic steamship tracks on the 23d, and moved thence east-northeast to about N. 58°, W. 16° by the 24th, after which it apparently disappeared over the British Isles. Very low pressure prevailed throughout its course, and on the 24th readings falling to about 28.80 (732) were reported near the storm-centre.

9.—This depression was a continuation of low area x, which moved eastward over the Gulf of Saint Lawrence during the 27th. By the 28th the storm-centre had advanced to about N. 53°, W. 42°, and by the 29th had passed east-northeast to about the twenty-seventh meridian, after which it disappeared north of the region of observation. On the 27th this depression was attended by pressure below 29.30 (744) over the Gulf of Saint Lawrence, and on the 28th by pressure below 29.50 (749), and strong to whole gales east of the Grand Banks, after which there was an apparent decrease in energy.

10.—This depression was a continuation of low area xi, which was central over Nova Scotia on the morning of the 29th. By the 30th the centre of disturbance had moved northeastward over Newfoundland, and on the 31st was central over mid-ocean north of the trans-Atlantic steamship tracks. On the 29th the pressure was below 29.40 (747) over Nova Scotia, and strong gales were reported to the southward, on the 30th

the pressure fell below 29.40 (747) northeast of Newfoundland, and on the 31st strong gales were reported over mid-ocean.

OCEAN ICE IN MARCH.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for March, during the last eight years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
March, 1882	42 30	50 00	March, 1882	46 30	46 00
March, 1883	41 46	49 48	March, 1883	48 40	43 03
March, 1884	41 20	54 05	March, 1884	45 00	40 15
March, 1885	40 55	49 04	March, 1885	45 57	43 15
March, 1886	40 20	49 02	March, 1886	47 20	44 40
March, 1887	41 00	49 07	March, 1887	45 31	42 56
March, 1888	43 30	50 37	March, 1888	47 23	46 56
March, 1889	44 20	53 00	March, 1889	44 20	53 00
March, 1890	41 01	50 54	March, 1890	46 40	39 50

In March, 1889, no icebergs were reported, and the only field ice reported was observed in N. 44° 20', W. 53° on the 2d.

In March, 1890, the southernmost ice reported, a large iceberg in N. 41° 01', W. 50° 54', on the 7th, was about one degree south of the average southern limit, and the easternmost ice reported, an iceberg in N. 46° 40', W. 39° 50', on the 25th, was about five degrees east of the average eastern limit of ice for March of preceding years. In March of preceding years Arctic ice was reported farther south than for the current month in 1885, 1886, and 1887, while the easternmost ice reported for the current month was east of the extreme eastern limit of ice for March of preceding years. Compared with February, 1890, there was a marked decrease in the quantity of field ice reported for the current month, and there was also a decrease in the aggregate number of icebergs reported. The bays of Newfoundland were generally full of ice, and heavy gulf ice seriously interfered with navigation to the southward of Newfoundland.

Compared with March of preceding years the Arctic ice reported for the current month was about equal in quantity to that reported for 1882, 1883, 1884, 1885, and 1887, the ice reported for March, 1888 and 1889, being largely deficient. The enormous and probably unparalleled quantity of Arctic ice encountered to the eastward and southeastward of Newfoundland during the past winter indicates that there was an abnormally heavy flow of ice from Greenland waters and an unusually open season in the Arctic regions during the summer of 1889. The winter was unusually cold in Newfoundland and vicinity, which condition resulted in an enormous accumulation of field ice along the Newfoundland and Labrador coasts, which was broken away by heavy gales, and the formation of unusually heavy ice in the Gulf of Saint Lawrence.

The following positions of icebergs and field ice reported for March, 1890, are shown on chart i by ruled shading:

1st.—N. 41° 49', W. 50° 09', large berg; N. 43° 46', W. 49° 13', field ice and bergs; N. 41° 54', W. 49° 58', large berg; N. 42° 48', W. 49° 45' to N. 42° 46', W. 51° 15', field ice; N. 42° 33', W. 50° 08' to N. 42° 19', W. 51° 16', field ice; N. 42° 42', W. 50° 17', large pieces of field ice and two bergs; N. 42° 17', W. 51° 05', berg; N. 42° 16', W. 50° 30', small bergs and field ice; N. 42° 58', W. 50° 00', drift ice and bergs; N. 42° 08', W. 50° 04' to N. 42° 07', W. 50° 28', two small bergs; N. 44° 30', W. 49° 11' to N. 44° 04', W. 49° 40', heavy pack ice; N. 43° 56', W. 50° 50', twelve large and some small bergs; N. 43° 44', W. 52° 10', seven large bergs; N. 45° 11', W. 47° 31', two large bergs; N. 42° 26', W. 51° 07', three small bergs and field ice.

1st-2d.—N. 42° 48', W. 49° 45' to N. 42° 40', W. 51° 15', heavy field ice.

2d.—N. 43° 16', W. 49° 30', large berg and field ice; N. 43° 57', W. 49° 42' to N. 42° 52', W. 50° 57', heavy field ice; N. 44° 53', W. 47° 20', large berg; N. 42° 20', W. 50° 59', small berg and field ice; N. 42° 00', W. 50° 20', large berg; N. 42°

00', W. 49° 48', one large and two small bergs; N. 42° 06', W. 50° 48', large berg and pieces of ice.

3d.—N. 42° 09', W. 51° 18', ten large bergs; N. 43° 00', W. 48° 30', field ice, one large and several small bergs; N. 42° 33', W. 50° 08' to N. 42° 19', W. 51° 16', patches of drift ice; N. 41° 35', W. 50° 53', large berg and small pieces of ice; N. 43° 34', W. 49° 00' to N. 42° 55', W. 50° 00', field ice with berg; N. 41° 34', W. 51° 34', small berg; N. 42° 03', W. 51° 14', small berg; N. 42° 00', W. 50° 00' berg; N. 42° 02', W. 51° 58', pieces of ice.

4th.—N. 42° 39', W. 51° 00' to N. 42° 46', W. 52° 17', field ice and large berg; N. 43° 14', W. 49° 48' to N. 43° 00', W. 50° 02', three large bergs and large pieces of field ice; the harbor of Saint John's, N. F., is full of ice, but it does not obstruct navigation; the Gulf of Saint Lawrence is blocked, and this season is the heaviest one for ice since 1882; N. 41° 15', W. 51° 20', two small bergs; N. 41° 44', W. 51° 10', two large bergs; N. 41° 44', W. 50° 32', four small bergs; N. 41° 44', W. 50° 10', large berg; N. 42° 10', W. 51° 40', small berg.

5th.—N. 42° 12', W. 50° 35', large berg; N. 42° 34', W. 64° 00', small ridge of field ice.

6th.—N. 43° 30', W. 51° 40', several large bergs; N. 43° 10', W. 51° 37', four flat bergs; N. 42° 45', W. 54° 50', small berg; N. 42° 15', W. 50° 55', very large berg; N. 42° 40', W. 51° 30', two large bergs and field ice.

7th.—N. 41° 09', W. 51° 09', large berg; N. 44° 30', W. 49° 11' to N. 44° 43', W. 49° 40', heavy pack ice; N. 43° 56', W. 50° 50', twelve large and small bergs; N. 43° 44', W. 52° 10', seven large bergs; N. 41° 01', W. 50° 54', large berg; N. 41° 09', W. 51° 09', large berg and small hummocks of ice.

8th.—N. 42° 56', W. 49° 34', large berg; N. 42° 37', W. 54° 00', small berg; N. 42° 18', W. 51° 40', large berg one-half mile long, 150 feet high; N. 42° 18', W. 53° 10', small berg; N. 42° 20', W. 55° 15', large berg.

9th.—N. 42° 22', W. 51° 36', large flat-topped berg; N. 42° 21', W. 54° 41', very large pointed berg; N. 43° 50', W. 48° 50', five bergs.

9-10th.—Heavy field ice from about 40 miles outside of Saint John's, N. F., to Banqueran. Was blocked in the ice until the night of the 10th; had to steer 125 miles to southward.

10th.—N. 42° 24', W. 55° 16', large berg; N. 42° 30', W. 55° 35', small berg with peak; N. 42° 29', W. 55° 46', large berg; N. 42° 40', W. 56° 01', small berg; N. 42° 18', W. 51° 40', large berg; N. 42° 18', W. 53° 10', small berg; N. 42° 20', W. 55° 15', large berg.

11th.—N. 42° 28', W. 55° 45', large berg, with two pinnacles; the harbor of Placentia, N. F., is blocked with ice; N. 41° 14', W. 50° 58', large berg.

12th.—N. 43° 18', W. 49° 35', to N. 42° 55', W. 51° 09', four large and four small bergs; N. 42° 51', W. 51° 19' to N. 42° 38', W. 53° 49', a large and several small bergs.

13th.—N. 42° 20', W. 50° 00', large berg; N. 43° 55', W. 50° 10', large bergs and pieces of ice.

14th.—N. 42° 08', W. 51° 20', small berg; N. 43° 45', W. 53° 48', large berg; N. 41° 10', W. 50° 22', small pieces of ice; N. 50° 16', W. 52° 49', heavy field ice.

16th.—N. 42° 14', W. 53° 44', small berg; N. 42° 13', W. 54° 18', large berg; N. 42° 13', W. 54° 26', large berg; N. 43° 04', W. 50° 20', small berg; N. 44° 40', W. 45° 30', large ice field; N. 43° 05', W. 49° 29', large berg; N. 45° 00', W. 48° 20', large floes of broken field ice.

17th.—N. 42° 41', W. 51° 41', small berg; N. 42° 23', W. 54° 36', large berg; N. 45° 01', W. 50° 25', two small bergs; N. 42° 50', W. 56° 10', two bergs.

18th.—N. 43° 40', W. 49° 18', three bergs; N. 43° 47', W. 48° 14', berg; N. 42° 56', W. 49° 50', several large bergs.

19th.—N. 42° 24', W. 54° 01', large berg; N. 42° 32', W. 54° 18', berg; N. 42° 49', W. 49° 47' very large berg; N. 43° 30', W. 48° 02', berg; N. 50° 40', W. 53° 11', heavy field ice.

20th.—N. 42° 41', W. 58° 07', two small bergs; N. 43° 26', W. 48° 40', flat berg; N. 45° 56', W. 59° 10', heavy ice floes; N. 45° 28', W. 46° 50', large berg; N. 44° 45', W. 48° 50',

twelve medium bergs, in field ice, ice to the northward as far as could be seen, sailed thirty miles south before clearing field.

21st.—N. 42° 49', W. 52° 20', large berg; N. 42° 52', W. 53° 36', small bergs; N. 43° 00', W. 50° 00', several bergs.

22d.—N. 42° 52', W. 49° 42', pieces of ice; N. 43° 34', W. 47° 41', two bergs; N. 43° 23', W. 48° 01', small berg; N. 43° 20', W. 48° 20', large round berg.

24th.—N. 44° 23', W. 45° 27', moderate sized berg.

25th.—N. 46° 40', W. 39° 50', berg; N. 44° 16', W. 45° 07', five bergs; N. 43° 28', W. 51° 04', large berg.

26th.—N. 42° 21', W. 48° 55', large mound of ice; N. 42° 29', W. 48° 54', large berg.

27th.—N. 44° 15', W. 45° 30', large berg; N. 44° 05', W. 46° 00', a long, low, and very dangerous berg, estimated length several miles.

28th.—N. 42° 48', W. 49° 22' to N. 42° 53', W. 49° 52', four bergs; N. 41° 40', W. 48° 50', medium berg; N. 45° 07', W. 44° 00' to N. 43° 35', W. 47° 35', five large and two small bergs.

29th.—N. 45° 24', W. 44° 29', several long, low, and high bergs; N. 40° 30', W. 45° 45', small bergs and field ice; N. 46° 41', W. 40° 14', berg; N. 44° 20', W. 46° 00', large berg; N. 43° 35', W. 47° 35', small berg.

30th.—N. 43° 06', W. 49° 36', large flat piece of ice; N. 42° 53', W. 49° 50', large, thick, solid berg; N. 43° 20', W. 49° 50', large berg; N. 46° 40', W. 42° 30' to N. 46° 20', W. 43° 00', eight large bergs; N. 43° 27', W. 50° 31', large berg; N. 43° 26', W. 50° 56', very large berg, about two hundred feet high and fully one thousand feet long; N. 44° 40', W. 43° 40', three large bergs; N. 43° 00', W. 50° 00', three large and two small bergs.

31st.—N. 44° 48', W. 45° 10', four very large flat bergs; N. 43° 00', W. 48° 12', two bergs and broken ice.

FOG IN MARCH.

The limits of fog belts west of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland fog was reported on nine dates; be-

tween the fifty-fifth and sixty-fifth meridians on eight dates; and west of the sixty-fifth meridian on six dates. Compared with the corresponding month of the last two years the dates of occurrence of fog near the Grand Banks numbered seven less than the average; between the fifty-fifth and sixty-fifth meridians one less than the average; and west of the sixty-fifth meridian the same as the average. Over and near the Banks of Newfoundland fog was reported on the 1st, 2d, 6th, 16th, 17th, 29th, and 30th with the approach or passage to the northward of low pressure storms; on the 4th with unsettled weather attending the disappearance of an area of low pressure over the Gulf of Saint Lawrence; and on the 14th with stormy weather attending the presence of a cyclonic area to the eastward and a second cyclonic area over the Saint Lawrence Valley. Between the fifty-fifth and sixty-fifth meridians fog was reported on the 2d, 12th to 14th, 22d, 23d, 28th, and 29th, with the approach or passage to the northward of areas of low pressure. West of the sixty-fifth meridian fog was reported on the 2d, 3d, 22d, 23d, 26th, and 29th, attending the passage to the northward of areas of low pressure.

The following are limits of fog-areas on the north Atlantic Ocean, west of the fortieth meridian, for March, 1890, as reported by shipmasters:

Date.	Entered.			Cleared.			Date.	Entered.			Cleared.		
	Lat. N.	Lon. W.		Lat. N.	Lon. W.			Lat. N.	Lon. W.		Lat. N.	Lon. W.	
1-2	42 07	49 42		41 30	55 14		16-17	44 00	48 10		42 56	54 30	
2	42 06	62 40		41 41	64 37		17	42 03	49 42		42 02	50 23	
3	41 12	64 13		41 10	64 39		22	37 58	75 03		38 26	74 49	
4	40 15	70 00		40 30	71 45		22	41 54	55 41		41 52	56 13	
2-3	33 45	74 38		33 55	74 32		22	41 14	64 58		41 12	65 30	
3-4	43 00	48 00		43 00	51 00		23	41 04	67 05		40 33	69 43	
3-4	42 30	49 18		42 17	55 29		23	44 04	63 55		43 30	64 35	
6	42 00	49 00		42 00	52 30		26	40 34	69 14		40 29	70 21	
12	42 27	65 49		42 25	66 50		28-29	43 04	63 20		43 04	67 20	
13-14	41 34	60 24		42 05	66 20		29	42 34	63 00		42 36	64 16	
14	41 15	49 15		41 21	48 00		29-30	42 24	49 40		42 14	51 52	
14	40 42	56 02		40 50	58 10								

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for March, 1890, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperature and the departure from the normal are given for regular stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for mean temperature and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. The monthly mean temperature for regular stations of the Signal Service represents the mean of the maximum and minimum temperatures.

For March, 1890, the mean temperature was highest over extreme southern Florida and in the lower Rio Grande valley, where the mean values were above 70°, the highest mean reading, 71°.2, being reported at Rio Grande City, Tex. Over the Florida Peninsula, extreme southern Mississippi, generally over the southern half of Louisiana, the southern half of Texas east of the ninety-eighth meridian, in the more southern part of western Texas, and in extreme southwestern Arizona the mean temperature was above 60°. South of a line traced from the coast of northern North Carolina irregularly south of west to northern Texas, thence southwestward to south-central Arizona, thence to central Arizona, and thence northwestward to the California coast near the fortieth parallel the mean temperature was above 50°. The lowest mean readings were noted in Manitoba and in extreme northern Ontario, where they were below 10°, the lowest mean temperature, 6°, being reported at Winnipeg, Man. The mean values were below 20°

north of a line traced from south of Rockliffe, Ont., to upper Michigan, thence irregularly westward to central North Dakota, and thence northwestward to the British Possessions north of eastern Montana; the mean temperature was also below 20° at stations in west-central Colorado. North of a line traced from Cape Breton Island, Gulf of Saint Lawrence, south of west to southern Iowa, and thence northwestward to extreme northwestern Montana, and over a considerable area of west-central Colorado the mean temperature was below 30°. On the immediate north Pacific coast the mean temperature varied from 43° to 47°; on the middle Pacific coast, from 47° to 55°; and on the south Pacific coast, from 52° to 58°.

For March, 1890, the mean temperature was generally above the normal along the eastern slope of the Rocky Mountains, from the south Pacific coast eastward over Texas, along the immediate Atlantic coast north of South Carolina, in New England, the Canadian Maritime Provinces, the Saint Lawrence Valley, the eastern part of the lower lake region, the northeastern part of the upper lake region, and in eastern Manitoba; elsewhere the month was cooler than usual. The greatest departures above the normal temperature were noted in eastern Nova Scotia and on the coast of northern North Carolina, where they exceeded 4°, and the departures above the normal were more than 3° in the central Saint Lawrence valley and in New Mexico. The greatest departures below the normal temperature were reported in central and northern Illinois, and in the British Possessions north of Montana, where they equalled or exceeded 5°; and over the entire upper Mississippi valley and in the middle Sacramento valley the departures below the normal temperature were more than 4°.

The following are some of the most marked departures from the normal at the older established stations:

Above normal.		Below normal.	
Cape Henry, Va.....	4.4	Springfield, Ill.....	5.8
Halifax, N. S.....	4.0	Riley, Ill.....	5.8
Montreal, Quebec.....	3.0	Qu'Appelle, N. W. T.....	5.0
Santa Fe, N. Mex.....	3.0	Sacramento, Cal.....	4.3
Fort Shaw, Mont.....	3.9	Wellisborough Pa.....	3.5

At Springfield, Ill., eleven years record, the current month was the coolest March ever noted for that station; the lowest mean temperature previously reported for March being 35°.4 in 1888. At Keokuk, Iowa, the mean temperature, 32°.6, was the same as the lowest mean previously reported, noted in 1877, and at Key West, Fla., the mean temperature has been lower in March in but one year, 1889.

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for March for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for March, 1890; (4) the departure of the current month from the normal; (5) and the extreme monthly means for March, during the period of observation and the years of occurrence:

State and station.	County.	(1) Normal for the month of March.	(2) Length of record.	(3) Mean for March, 1890.	(4) Departure from normal.	(5) Extreme monthly mean temperature for March.			
						Highest.	Year.	Lowest.	Year.
<i>Arkansas.</i>		°	Years	°	°	°		°	
Lead Hill.....	Boone.....	48.7	8.	46.4	- 2.3	55.4	1882	45.5	1885
<i>California.</i>									
Sacramento.....	Sacramento.....	54.8	37	49.3	- 5.5	59.8	1853	48.8	1880
<i>Connecticut.</i>									
Middletown.....	Middlesex.....	32.4	21	32.7	+ 0.3	40.7	1871	25.7	1872
<i>Florida.</i>									
Merritt's Island.....	Brevard.....	64.8	7	62.9	- 1.9	71.1	1884	61.6	1889
<i>Georgia.</i>									
Forsyth.....	Monroe.....	56.9	16	55.4	- 1.5	61.7	1880, '82	51.4	1885
<i>Illinois.</i>									
Peoria.....	Peoria.....	38.4	34	35.1	- 3.3	45.8	1871	29.4	1867
Riley.....	McHenry.....	31.4	33	25.6	- 5.8	41.7	1878	23.8	1872
<i>Indiana.</i>									
Vevay.....	Switzerland.....	42.7	23	39.4	- 3.3	50.7	1878	35.7	1883
<i>Iowa.</i>									
Cresco.....	Howard.....	26.3	18	22.6	- 3.7	42.3	1878	19.6	1888
Monticello.....	Jones.....	32.1	35	27.5	- 4.6	45.8	1878	23.8	1867
Logan.....	Harrison.....	35.2	16	31.6	- 3.6	48.0	1878	28.3	1875
<i>Kansas.</i>									
Lawrence.....	Douglas.....	42.3	26	37.3	- 4.5	51.2	1868	34.2	1876
Wellington.....	Sumner.....	43.9	11	43.9	0.0	49.6	1879	39.0	1883
<i>Louisiana.</i>									
Grand Coteau.....	Saint Landry.....	61.9	7	61.2	- 0.7	66.2	1884	59.5	1885
<i>Maine.</i>									
Gardiner.....	Kennebec.....	29.2	49	29.5	+ 0.3	37.5	1871	13.4	1884
<i>Maryland.</i>									
Cumberland.....	Allegany.....	37.0	31	36.3	- 0.7	46.0	1878	30.0	1875
<i>Massachusetts.</i>									
Amherst.....	Hampshire.....	32.7	34	31.9	- 0.8	40.5	1871	24.5	1843
Newburyport.....	Essex.....	32.1	10	33.0	+ 0.9	36.7	1869	27.0	1885
Somerset.....	Bristol.....	34.1	17	35.2	+ 1.1	39.8	1878	28.2	1885
<i>Michigan.</i>									
Kalamazoo.....	Kalamazoo.....	31.2	14	30.2	- 1.0	42.2	1878	22.5	1883
Thornville.....	Lapeer.....	30.9	13	28.3	- 2.6	41.1	1875	21.0	1885
<i>Minnesota.</i>									
Minneapolis.....	Hennepin.....	24.9	23	22.2	- 2.7	43.6	1878	11.6	1867
<i>Montana.</i>									
Fort Shaw.....	Lewis & Clarke.....	33.0	19	35.9	+ 2.9	41.8	1889	21.7	1870
<i>New Hampshire.</i>									
Hanover.....	Grafton.....	27.8	36	27.8	0.0	35.5	1871	19.0	1872, '75
<i>New Jersey.</i>									
Moorestown.....	Burlington.....	37.5	27	37.2	- 0.3	45.4	1871	29.7	1885
South Orange.....	Essex.....	35.7	18	34.8	- 0.9	42.5	1878	26.5	1872
<i>New York.</i>									
Cooperstown.....	Otsego.....	27.4	36	26.3	- 1.1	37.2	1871	18.3	1885
Palermo.....	Oswego.....	27.2	30	27.8	+ 0.6	38.1	1878	17.1	1885
<i>North Carolina.</i>									
Lenoir.....	Caldwell.....	45.6	16	44.4	- 1.2	51.6	1878	35.0	1877
<i>Ohio.</i>									
N'th Lewisburgh.....	Champaign.....	37.7	58	35.0	- 2.7	48.0	1842	21.0	1843
Wauson.....	Fulton.....	30.9	21	30.8	- 0.1	43.2	1878	24.5	1865
<i>Oregon.</i>									
Albany.....	Linn.....	47.6	10	45.6	- 2.0	53.9	1885	40.4	1880
Eola.....	Polk.....	45.5	20	43.4	- 2.1	54.2	1884	38.5	1880
<i>Pennsylvania.</i>									
Dyberry.....	Wayne.....	28.6	25	27.5	- 1.1	36.9	1878	19.5	1885
Grampian Hills.....	Clearfield.....	30.6	25	28.4	- 2.2	40.4	1878	20.1	1885
Wellisborough.....	Tioga.....	31.3	10	27.8	- 3.5	37.6	1882	22.4	1885
<i>South Carolina.</i>									
Statesburgh.....	Sumter.....	52.9	9	53.6	+ 0.7	59.0	1882	45.3	1885

Deviations from normal temperatures—Continued.

State and station.	County.	(1) Normal for the month of March.	(2) Length of record.	(3) Mean for March, 1890.	(4) Departure from normal.	(5) Extreme monthly mean temperature for March.			
						Highest.	Year.	Lowest.	Year.
<i>Tennessee.</i>		°	Years	°	°	°		°	
Austin.....	Wilson.....	47.5	19	45.4	- 2.1	57.3	1868	40.8	1876
Milan.....	Gibson.....	47.5	7	43.4	- 3.1	50.2	1887, '89	43.4	1890
<i>Texas.</i>									
New Ulm.....	Austin.....	62.4	17	62.5	+ 0.1	63.9	1879	51.8	1888
<i>Vermont.</i>									
Strafford.....	Orange.....	26.0	17	25.8	- 0.2	33.8	1878	17.2	1883
<i>Virginia.</i>									
Birdsnest.....	Northampton.....	45.1	21	46.4	+ 1.3	54.1	1878	35.8	1872
<i>Wisconsin.</i>									
Madison.....	Dane.....	30.2	25	25.2	- 5.0	37.1	1889	23.2	1888
<i>Washington.</i>									
Fort Townsend.....	Jefferson.....	44.8	17	43.1	- 1.7	50.7	1885	38.7	1880

MAXIMUM AND MINIMUM TEMPERATURES.

The highest temperature reported by a regular station of the Signal Service was 103°, at Rio Grande City, Tex., on the 27th, and the maximum temperature rose to, or above, 90° over a greater part of the interior of Texas, at Yuma, Ariz., and at Micco, Fla. North of a line traced from the South Carolina coast westward to central Mississippi, thence northward to western Tennessee, thence westward over the northern part of Indian Territory, and thence southwestward to extreme southwestern New Mexico, and over southwestern Arizona, at Los Angeles, Cal., and at stations in extreme southeastern Virginia the maximum temperature was above 80°. The lowest maximum temperature, 40°, was reported at Marquette, Mich., and Saint Vincent, Minn. The maximum values were below 50° in eastern, extreme southeastern, and northern New England, and north of a line traced over central Michigan and southern Wisconsin, thence northward to the western extremity of Lake Superior, thence southwestward to northeastern South Dakota, and thence west of north over North Dakota. At stations in the Atlantic coast and west Gulf states, the Rio Grande Valley, and the southeastern slope of the Rocky Mountains the maximum temperature was as high or higher than reported for March of preceding years. At New London, Conn., twenty years record, the maximum temperature for the current month, 64°, was the same as that of 1878; at Albany, N. Y., seventeen years record, 67°, the same as maximum of 1886; Baltimore, Md., twenty years record, 77°, 1° above maximum of 1880; Norfolk, Va., twenty years record, 81°, the same as maximum of 1880; Hatteras, N. C., sixteen years record, 72°, 2° above maximum of 1884; Kitty Hawk, N. C., sixteen years record, 81°, 1° above maximum of 1880; Palestine, Tex., nine years record, 87°, 2° above maximum of 1887; Rio Grande City, Tex., fourteen years record, 103°, 5° above maximum of 1884; Abilene, Tex., five years record, 92°, 1° above maximum of 1887. In March of preceding years the highest maximum temperatures have generally occurred in New England in 1880; in the lower lake region in 1875; in the extreme northwest in 1889; in the upper Mississippi valley in 1875 or 1879; over the southern plateau region in 1879 or 1887; over the middle plateau region in 1879 or 1888; and along the south Pacific coast in 1879; elsewhere the periods of occurrence were irregular. The reports of United States Army post surgeons and state weather service and voluntary observers show the following maximum temperatures in states and territories where the temperature was reported 80° or above: Citronelle and Wiggins, Ala., 84°; Florence and Fort Lowell, Ariz., 89°; Texarkana, Ark., 85°; Riverside, Cal., 83°; River Bend, Colo., 88°; Alva, Fla., 93°; Millen, Ga., 87°; Caddo Creek, Ind. T., 86°; Kellogg and Eureka Ranch, Kans., 85°; Cameron, La., 89°; Booneville, Miss., 86°; Fort Selden, N. Mex., 90°; New Berne, N. C., 82°; Hardeeville, S. C., 85°; Cog Hill, Tenn., 80°; Camp del Rio, Tex., 105°; Birdsnest and Smithfield, Va., 82°.

The lowest temperature reported by a regular station of the

Signal Service was -30° , at Saint Vincent, Minn., on the 5th. The minimum temperature fell below -20° over a greater part of North Dakota, in northwestern Minnesota, northeastern Wisconsin, and the eastern part of upper Michigan; and was below -10° north of a line traced from central New Hampshire westward to the northern part of lower Michigan, thence southwestward to central Iowa, and thence west-northwest over northeastern Montana. The minimum readings were below zero north of a line traced from extreme northeastern Massachusetts westward, north of the stations on the southern coasts of the lower lakes, to southern Michigan, thence southwestward to central Missouri, thence northwestward to west-central Iowa, thence westward to southeastern Wyoming, thence southward over east-central Colorado, thence westward to south-central Utah, and thence northward over central Montana; and were below 30° , except over the southern half of the Florida Peninsula, at Port Eads, La., Brownsville, Tex., southwestern Arizona, southern and western California, and along the immediate Pacific coast. The highest minimum temperature reported by a regular station of the Signal Service was 48° at Key West, Fla., and the minimum values were above 40° along the California coast south of San Francisco, over extreme southern California, and at Yuma, Ariz. At stations in the south Atlantic states, the Florida Peninsula, the east and west Gulf states, the Rio Grande Valley, Tennessee, the upper Mississippi and Missouri valleys, the southeastern slope of the Rocky Mountains, the southern, middle, and northern plateau regions, and on the north Pacific coast the minimum temperature was as low or lower than previously reported for March. At Charlotte, N. C., the minimum temperature for the current month, 19° , was 1° below the minimum of March, 1888; Hatteras, N. C., sixteen years record, 26° , the same as minimum of 1888; Southport, N. C., fifteen years record, 21° , the same as minimum of 1876; Charleston, S. C., twenty years record, 25° , 3° below minimum of 1876; Savannah, Ga., twenty years record, 26° , 1° below minimum of 1873; Jacksonville, Fla., nineteen years record, 27° , 4° below minimum of two or more preceding years; Cedar Keys, Fla., eleven years record, 30° , 6° below minimum of 1886; Key West, Fla., twenty years record, 48° , 5° below minimum of two or more years; Atlanta, Ga., twelve years record, 17° , 3° below minimum of 1885; Pensacola, Fla., eleven years record, 25° , 6° below minimum of 1885; Mobile, Ala., twenty years record, 25° , 4° below minimum of 1885; Montgomery, Ala., eighteen years record, 21° , 4° below minimum of 1873; Vicksburg, Miss., nineteen years record, 24° , 3° below minimum of two or more years; New Orleans, La., twenty years record, 30° , 6° below minimum of 1885; Shreveport, La., nineteen years record, 22° , 4° below minimum of 1876; Fort Smith, Ark., eight years record, 15° , 8° below minimum of 1888; Little Rock, Ark., eleven years record, 16° , 7° below minimum of 1886; Galveston, Tex., nineteen years record, 30° , 4° below minimum of 1875; Palestine, Tex., nine years record, 20° , 7° below minimum of 1886; San Antonio, Tex., thirteen years record, 21° , 6° below minimum of 1880; Brownsville, Tex., fifteen years record, 31° , 4° below minimum of 1880; Rio Grande City, Tex., fourteen years record, 24° , 8° below minimum of 1884; Chattanooga, Tenn., twelve years record, 15° , 5° below minimum of 1885; Memphis, Tenn., twenty years record, 17° , 1° below minimum of 1876; Davenport, Iowa, nineteen years record, -8° , the same as minimum of 1884; Des Moines, Iowa, twelve years record, -8° , 2° below minimum of 1884; Keokuk, Iowa, nineteen years record, -6° , 4° below minimum of 1873; Springfield, Ill., eleven years record, 2° , 4° below minimum of 1888; Saint Louis, Mo., twenty years record, 6° , 2° below minimum of two or more years; Huron, S. Dak., nine years record -15° , the same as minimum of 1884; Leavenworth, Kans., nineteen years record, zero, 2° below minimum of 1876; Abilene, Tex., five years record, 20° , 2° below minimum of 1886; Fort Stanton, N. Mex., seven years record, 6° , 4° below minimum of 1888; Lava, N. Mex., six years record, 14° , 5° below minimum of 1886; Fort Bowie,

Ariz., seven years record, 24° , 4° below minimum of 1886; Salt Lake City, Utah, seventeen years record, zero, 4° below minimum of 1874; Montrose, Colo., six years record, -2° , 5° below minimum of 1888; Walla Walla, Wash., five years record, 7° , 5° below minimum of 1888; Portland, Oregon, nineteen years record, 24° , the same as minimum of 1888. In March of preceding years the lowest minimum temperatures have generally occurred in the east Gulf states in 1885 or 1888; in the upper Mississippi valley in 1873 or 1884; in the Missouri Valley in 1876 or 1888; on the northeastern slope of the Rocky Mountains in 1888; on the north Pacific coast in 1884 or 1888; and on the middle Pacific coast in 1880 or 1888; elsewhere the periods of occurrence were irregular.

The reports of United States Army post surgeons and state weather service and voluntary observers show the following minimum temperature in states and territories where the temperature fell to or below zero: Pokegama Falls, Minn., -40° ; Gallatin and Sanborn, N. Dak., -36° ; Embarrass, Wis., and Grayling, Mich., -35° ; Fraser, Colo., -27° ; Belvidere, Ill., -26° ; Elkader, Iowa, -24° ; Webster, S. Dak., -23° ; Camp Poplar River, Mont., Fort Niobrara, Nebr., and West Milan, N. H., -22° ; Queensbury, N. Y., and Philipsburgh, Pa., -21° ; East Berkshire, Vt., -19° ; Soda Springs, Idaho, and Fairfield, Me., -16° ; Fort D. A. Russell, Wyo., -15° ; Tannery, W. Va., and Orangeville, Ohio, -14° ; Ludlow (2), Mass., -13° ; Princeton, Mo., -11° ; Nephi, Utah, -10° ; New Hartford, Conn., -9° ; Lone Rock, Oregon, -8° ; New Providence, Ind., -6° ; Tribune, Kans., -5° ; Chama and Fort Union, N. Mex., -4° ; Flagstaff, Ariz., and Fort Walla Walla, Wash., -2° ; Bolar, Va., and Tenaflly, N. J., zero.

A noteworthy feature of the month was the extremely high and low temperatures noted over the eastern and southern portions of the country. On the first the temperature was the lowest ever known for March from New Orleans, La., and Brownsville, Tex., where freezing weather prevailed, northward to Keokuk and Des Moines, Iowa, where the temperature was -8° , and from western Florida to southern Texas the temperature was lower than at any time during the past winter. On the 7th the temperature was lower than at any time during the past winter in Massachusetts, Rhode Island, and Connecticut, and in the middle Atlantic states from New York to northern Virginia and westward to eastern Ohio. On the 16th the temperature was lower than at any time during the past winter in the western parts of North and South Carolina and in eastern Tennessee. On the 28th the temperature was the highest on record for the season of the year in Maryland and the eastern portions of Virginia and North Carolina.

LIMITS OF FREEZING WEATHER.

The southern limit of freezing weather for March, 1890, is shown on chart iv by a line traced westward over the Florida Peninsula in about latitude N. 28° and over the extreme southern part of Louisiana between New Orleans and Port Eads. The western limit of freezing weather is shown by a line traced from the California coast in about latitude N. $40^{\circ} 30'$ westward to the Sacramento Valley north of Red Bluff, Cal., thence east of south over central California, east of the Sacramento and San Joaquin rivers, to about the thirty-seventh parallel, thence eastward over southern Nevada, and thence east of south to south-central Arizona. Compared with the limits of freezing weather for February, 1890, the line showing the southern limit of freezing weather for the current month was about eight degrees farther south on the immediate Atlantic coast; and two to three degrees farther south in the east and west Gulf states. On the Pacific coast and in the southern plateau region the line of freezing weather was somewhat farther north and east than the line traced for the preceding month.

RANGES OF TEMPERATURE.

The greatest and least daily ranges of temperature at regular stations of the Signal Service are given in the table of miscellaneous meteorological data. The greatest monthly ranges of temperature occurred in north-central South Dakota and

extreme southern Illinois, where they exceeded 80°, whence they decreased eastward to less than 50° in extreme western New York, thence increased to more than 70° in northeastern New York and northwestern New England, and thence decreased to 40° over extreme southeastern Massachusetts and eastern Maine. From the upper Mississippi and middle Missouri valleys the monthly ranges decreased southeastward to less than 40° over extreme southern Florida and extreme southern Louisiana, southward to less than 60° along the southern portion of the west Gulf coast, southwestward to less than 40° on the extreme south Pacific coast, and westward to less than 30° on the middle and north Pacific coasts.

The following are some of the extreme monthly ranges:

Greatest.		Least.	
Cairo, Ill.....	85.0	Tatoosh Island, Wash.....	30.0
Fort Sully, S. Dak.....	81.0	Point Reyes Light, Cal.....	36.0
Pueblo, Colo.....	78.0	Port Eads, La.....	31.0
Northfield, Vt.....	72.0	San Diego, Cal.....	33.0
Sault de Ste. Marie, Mich.....	71.0	Key West, Fla.....	34.0
Taylor's Ranch, Utah.....	70.0	Eastport, Me.....	36.0

The following is a summary of reports of damaging frost made by regular and voluntary observers of the Signal Service: On the 1st great damage was caused to fruit and vegetables in the country about Shreveport, La., and Corpus Christi, Tex. On the 2d frost destroyed all kinds of growing crops about Knoxville, Tenn.; at Amite City, Houma, and Grand Coteau, La., the freeze and frost of the first part of the month killed tender vegetables and injured fruit trees; in Alabama the freeze of the 2d and 3d did considerable damage to tender buds, and at Montgomery ice formed one-eighth of an inch thick; a report from Jacksonville, Fla., states that the severe frost of the 2d and 3d badly damaged fruit and vegetables in different sections of the state. On the 2d, 3d, and 6th, heavy frost severely injured vegetation at University, Miss.; the low temperature of the first few days of the month was very destructive to fruit buds, etc., in Kentucky; at Homeland, Fla., the freeze of the 3d injured orange blossoms; at Jupiter, Fla., the heavy frost of the 4th did much damage to vegetation; and at Spartanburgh, S. C., the frost of the 3d killed peach blooms, flowers, and vegetables; heavy frost on 3d, 9th, and 16th caused great damage to tender vegetation in the country around Savannah, Ga. On the 12th killing frost destroyed much fruit in the valley of the Gila River, Ariz. The freezing weather of the 15th and 16th materially damaged all fruit in the vicinity of Springfield, Mo. On the 16th killing frost was reported at Mobile, Ala., and Titusville, Fla.; and light frost occurred at Pensacola, Cedar Keys, and Jupiter, Fla.; at the latter-named stations the frost was nearly two weeks later than any previous record of frost; on this date early vegetation around Charleston, S. C., was greatly damaged by frost, and at Wilmington, N. C., ice formed four inches in thickness, and tender vegetation was killed. On the 17th thousands of young orange trees were reported killed by freezing weather at Homeland, Fla.; at Jupiter and Manatee, Fla., heavy frost did much damage to vegetation; and considerable damage was caused to the fruit and vegetable crops in other sections of Florida.

The dates of killing frost in the Gulf States in the first part of the month about corresponded with the average dates of last killing frost in that region, while the killing frosts of the middle of the month were four to six weeks later than usual in Florida; about one to two weeks later than usual in the southern parts of the east Gulf states; and about seasonable in North and South Carolina. The average date of last killing frost in central Florida is February 1st, and the records of this office give the northern part of Lee Co., Fla., where frost was reported on the 3d, 4th, and 17th of the current month, as the extreme southern limit of frost ever reported for any month.

The southern limit of frost in the Atlantic coast states for the current month was about seven degrees farther south than in February, 1890, and extended southward to Lee Co., Fla.; in the eastern part of the east Gulf states the southern limit was about three degrees farther south than for the preceding month, while to the westward of the Mississippi River and on the Pacific coast frost was reported to the southern borders of the country for both the current and the preceding month.

In the south Atlantic and Gulf states frost was reported most frequently in North Carolina, where it was noted for twenty-five dates; in Georgia and South Carolina for sixteen dates; in Alabama, Arkansas, and Mississippi for thirteen dates; in Louisiana and Texas for ten dates; and in Florida for six dates. On the Pacific coast frost was noted in Oregon for twenty-one dates; in Washington for fourteen dates; in northern California for twenty-three dates; and in southern California for ten dates. On the 19th, 25th, 26th, and 27th no frost was reported in the south Atlantic and Gulf states.

In the south Atlantic and Gulf states frost was reported in nine states on the 2d, 3d, 4th, and 16th; in eight states on the 1st and 15th; in seven states on the 6th and 7th; in six states on the 29th; and in from one to five states, inclusive, on the 5th, 6th to 14th, 17th, 18th, 20th to 24th, 28th, 30th, and 31st. In northern California frost was reported on the 1st to 15th, 19th, 21st, 23d, 24th, 26th, 27th, 28th, and 31st; in southern California on the 10th to 15th, 20th, 21st, 26th, and 31st; in Oregon on the 1st, 3d, 6th to 14th, 18th, 19th, 20th, 23d, 24th, 25th, 27th, 28th, 30th, and 31st; and in Washington on the 1st, 5th, 6th, 8th to 12th, 14th, 17th, 19th, 21st, 30th, and 31st.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for March, 1890:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
Boston, Mass.....	43.4	34.8	8.6	37.7	34.9
Canby, Fort, Wash.....	48.0	40.5	7.5	44.7	44.0
Cedar Keys, Fla.....	75.0	39.8	35.2	60.1	60.1
Charleston, S. C.....	63.2	52.6	10.6	58.5	56.4
Eastport, Me.....	37.2	34.9	2.3	35.9	39.4
Galveston, Tex.....	71.0	49.5	21.5	62.9	62.1
Key West, Fla.....	81.5	64.7	16.8	73.5	70.6
Portland, Oregon.....	46.9	36.4	10.5	43.5	45.2

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for March, 1890, as determined from the reports of nearly 2,000 stations, is exhibited on chart iii. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for each Signal Service station. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by

adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

The heaviest monthly precipitation reported for March, 1890, was 19.83, at Sims, Shasta Co., Cal. The monthly precipitation amounted to 17.83 at Upper Mattole, Cal.; to 17.58 at South Fork, Ky.; to 16.70 at Marengo, Ind.; to 16.50 at Delta, Cal., and a depth of 14.20 was reported at Oak Ridge, Mo. On the central coast of Massachusetts, in eastern and south-central Kentucky, north-central Tennessee, southwest-

ern Indiana, central Arkansas, southwestern Mississippi, in eastern California between the thirty-eighth and thirty-ninth parallels, and on the Pacific coast between the thirty-eighth and forty-third parallels, and within a limited area south of San Francisco the monthly precipitation exceeded ten inches. In southeastern California and the adjoining part of Arizona, in southeastern Arizona, southwestern and south-eastern New Mexico, a great part of southwestern Texas, within an area extending from the central part of the Panhandle of Texas northward over western Kansas, and in north-central Kansas no precipitation was reported; and at stations in east-central Florida, west-central Illinois, southwestern Iowa, northeastern lower Michigan, western Minnesota, west-central Missouri, central North and South Dakota, southwestern Nebraska, southeastern Colorado, western Indian Territory, northern Montana, northern Utah, central and southern Wyoming, southern and southwestern Nevada, and northeastern Oregon less than one-half inch of precipitation was reported.

The precipitation was generally in excess of the average for the month along the Atlantic coast from the Gulf of Saint Lawrence to Maryland, and thence southwestward over the Ohio Valley, western Tennessee, Arkansas, northeastern Texas, at Galveston, Tex., northern Alabama and Mississippi, a greater part of Missouri, along the Mississippi River south of Davenport, Iowa, in the central upper lake region, at stations on the south shore of Lake Erie, on the northeastern slope of the Rocky Mountains, generally in the middle and northern plateau regions, and along the middle and north Pacific coasts. The monthly precipitation was also above the normal at Key West, Fla. Elsewhere the precipitation was deficient. The greatest departures above the average precipitation occurred in the central Ohio valley, where they exceeded 5.00; in south-central Nova Scotia, southeastern Massachusetts, and from north-central Kentucky southwestward over western Tennessee they were more than 4.00, and in northern California more than 3.00 in excess of the normal. The greatest departures below the average precipitation were noted in southwestern Alabama, where they exceeded 5.00; the deficiencies exceeded 4.00 over a considerable area in the southern parts of the east Gulf states, and on the coast of northern North Carolina. Considered by districts the average percentages of the normal precipitation in districts where the precipitation was in excess were about as follows: northern plateau region, 215 per cent.; New England, 162 per cent.; middle Pacific coast, 157 per cent.; middle plateau region, 142 per cent.; Ohio Valley and Tennessee, 139 per cent.; west Gulf states, 124 per cent.; upper Mississippi valley, 111 per cent.; middle Atlantic states, 109 per cent.; northeastern slope of the Rocky Mountains and north Pacific coast, 106 per cent. In districts where the monthly precipitation was deficient the percentages of the normal were about as follows: middle-eastern slope of the Rocky Mountains, 12 per cent.; Rio Grande Valley, 13 per cent.; southeastern slope of the Rocky Mountains, 18 per cent.; south Pacific coast, 25 per cent.; east Gulf states, 47 per cent.; southern plateau region and south Atlantic states, 50 per cent.; Florida Peninsula, 71 per cent.; extreme northwest, 87 per cent.; Missouri Valley, 90 per cent.; lower lake region, 92 per cent.; upper lake region, 93 per cent. In the northern plateau region more than double the usual amount of precipitation was reported, and in New England, the Ohio Valley and Tennessee, the middle plateau region, and the middle Pacific coast the precipitation was about one-half greater than the average. In the Rio Grande Valley and over the middle-eastern slope of the Rocky Mountains about one-eighth of the usual amount of precipitation fell, over the southeastern slope of the Rocky Mountains and on the south Pacific coast about one-fourth, and in the south Atlantic and east Gulf states and the southern plateau region about one-half the average precipitation for March was reported.

For the period January to March, 1890, inclusive, the greatest excesses in precipitation have occurred in the Ohio Valley

and Tennessee and on the middle Pacific coast, where the precipitation has been about fifty per cent. in excess of the usual amount, and the most marked deficiencies have been noted for the south Atlantic and east Gulf states, the Florida Peninsula, and the Rio Grande Valley, where but about fifty per cent. of the usual amount of precipitation for the period named has been reported.

The table of miscellaneous meteorological data for regular stations of the Signal Service and the table of deviations from normal precipitation for certain stations, as reported by voluntary stations, shows that at the following-named places the precipitation for the current month was the heaviest ever measured for March during the respective periods of observation: Manchester, N. H.; Somerset, Nantucket, Newburyport, and Vineyard Haven, Mass.; Narragansett Pier, R. I.; Moorestown, N. J.; Cumberland, Md.; Titusville, Fla.; Fort Smith and Lead Hill, Ark.; Brownsville, Tex.; Milan, Tenn.; Lexington and Louisville, Ky.; Vevay, Ind.; Cincinnati and Columbus, Ohio; Valentine, Nebr.; Winnemucca, Nev.; Boise City, Idaho; and Walla Walla, Wash. At Auburn and Mobile, Ala.; Topeka and Concordia, Kans.; Crete, Nebr.; Fort Supply, Ind. T.; Fort Stanton, N. Mex.; El Paso, Tex.; and Fresno, Cal., the precipitation was the least reported for March during the respective periods of observation.

In March of preceding years the heaviest precipitation was generally noted in Virginia in 1884; in Florida in 1889; on the northeastern slope of the Rocky Mountains in 1888; over the southern plateau region in 1884; and along the middle and south Pacific coasts in 1884 and 1889; elsewhere the periods of occurrence of greatest precipitation for March were irregular. The least amount of precipitation for March was generally reported in New England in 1885 or 1889; in the south Atlantic states and the southern plateau region in 1887; in the Ohio Valley and Tennessee in 1885 or 1889; in the upper Mississippi valley in 1885; over the middle plateau region in 1887 or 1888; and on the north Pacific coast in 1884 or 1885; elsewhere the periods of occurrence of least precipitation for March were irregular.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for March for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for March, 1890; (4) the departure of the current month from the average; (5) the extreme monthly precipitation for March.

State and station.	County.	(1) Average for the month of March.	(2) Length of record.	(3) Total for March, 1890.	(4) Departure from average.	(5) Extreme monthly precipitation for March.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		Inches	Years	Inches	Inches	Inches		Inches	
Lead Hill.....	Boone.....	3.73	8	6.78	+3.05	6.78	1890	2.84	1887
California.									
Sacramento.....	Sacramento..	2.98	40	3.73	+0.75	10.00	1850	0.09	1885
Connecticut.									
Middletown.....	Middlesex...	4.57	28	7.45	+2.88	9.49	1876	1.12	1874
Florida.									
Merritt's Island..	Brevard.....	2.76	13	1.03	-1.73	7.92	1878	0.76	1882
Georgia.									
Forsyth.....	Monroe.....	7.20	16	2.66	-4.54	12.87	1875	1.37	1878
Illinois.									
Peoria.....	Peoria.....	2.54	35	2.73	+0.19	5.82	1859	0.24	1885
Riley.....	McHenry....	2.64	39	2.14	-0.50	7.23	1876	0.29	1885
Indiana.									
Logansport.....	Cass.....	3.03	15	4.85	+1.82	6.89	1861	0.95	1856
Vevay.....	Switzerland..	3.77	25	7.84	+4.07	7.84	1890	0.85	1889
Iowa.									
Cresco.....	Howard.....	1.82	17	1.06	-0.76	4.55	1888	0.22	1889
Monticello.....	Jones.....	2.52	35	1.86	-0.66	6.54	1877	0.07	1869
Logan.....	Harrison....	2.06	22	3.52	+1.46	4.50	1876	0.30	1885
Kansas.									
Lawrence.....	Douglas.....	2.29	22	1.02	-1.27	5.47	1888	0.37	1879
Wellington.....	Sumner.....	1.40	11	0.38	-1.02	2.97	1889	0.00	1879
Louisiana.									
Grand Coteau....	St. Landry..	5.60	7	3.40	-2.20	10.20	1884	2.28	1887

Deviations from average precipitation—Continued.

State and station.	County.	(1) Average for the month of March.	(2) Length of record.	(3) Total for March, 1890.	(4) Departure from average.	(5) Extreme monthly precipitation for March.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
<i>Maine.</i>		<i>Inches</i>	<i>Years</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>		<i>Inches</i>	
Gardiner	Kennebec ...	3.93	50	4.52	+0.59	10.06	1859	0.90	1856
<i>Maryland.</i>									
Cumberland	Allegany ...	2.75	18	5.18	+2.43	5.19	1890	0.50	1872
<i>Massachusetts.</i>									
Amherst	Hampshire ..	3.43	54	5.25	+1.83	7.14	1876	0.89	1858
Newburyport	Essex	3.96	10	6.89	+2.93	6.94	1890	0.96	1885
Somerset	Bristol	4.71	17	9.61	+4.90	9.61	1890	1.14	1885
<i>Michigan.</i>									
Kalamazoo	Kalamazoo ...	2.52	14	1.95	-0.56	7.33	1877	0.43	1883
Thornville	Lapeer	2.42	13	1.94	-0.48	4.67	1877	0.71	1889
<i>Minnesota.</i>									
Minneapolis	Hennepin ...	1.83	34	1.69	-0.14	9.00	1868	0.38	1883
<i>Montana.</i>									
Fort Shaw	Lewis & Clarke	0.45	19	0.48	+0.03	1.05	1883	0.04	1873
<i>New Hampshire.</i>									
Hanover	Grafton	2.33	50	3.24	+0.91	5.25	1888	0.25	1866
<i>New Jersey.</i>									
Moorestown	Burlington ...	3.49	26	6.09	+2.51	6.09	1890	1.06	1885
South Orange	Essex	3.70	18	6.71	+3.01	8.20	1888	0.81	1885
<i>New York.</i>									
Cooperstown	Otsego	2.85	36	4.17	+1.32	5.29	1871	0.55	1885
Palermo	Oswego	2.88	36	1.49	-1.39	7.00	1859	0.68	1885
<i>North Carolina.</i>									
Lenoir	Caldwell	4.06	18	3.30	-0.76	10.20	1875	0.50	1879
<i>Ohio.</i>									
N. Lewisburgh	Champaign ...	3.06	14	4.90	+1.84	5.90	1888	0.75	1889
Wauseon	Fulton	2.77	18	3.45	+0.68	6.52	1876	0.63	1885
<i>Oregon.</i>									
Albany	Linn	4.28	13	6.86	+2.58	11.71	1866	0.81	1885
Eola	Folk	4.84	21	4.26	-0.58	10.66	1879	0.55	1885
<i>Pennsylvania.</i>									
Dyberry	Wayne	2.93	23	5.20	+2.27	5.80	1890	1.03	1885
Grampian Hills	Clearfield ...	3.89	19	5.29	+1.40	6.89	1875	1.34	1885
Wellsborough	Tioga	5.07	10	6.03	+0.96	10.08	1884	0.66	1887
<i>South Carolina.</i>									
Statesburgh	Sumter	3.84	9	3.53	-0.31	5.90	1888	0.97	1887
<i>Tennessee.</i>									
Austin	Wilson	5.45	19	9.56	+4.11	12.99	1875	1.93	1861
Milan	Gibson	4.02	7	8.41	+4.39	8.41	1890	1.94	1885
<i>Texas.</i>									
New Ulm	Austin	4.87	17	3.07	-1.80	13.13	1883	1.27	1887
<i>Vermont.</i>									
Stratford	Orange	3.68	17	3.70	+0.02	4.10	1876	1.55	1878
<i>Virginia.</i>									
Birdenest	Northampton	4.94	21	3.65	-1.29	8.75	1884	1.70	1873
<i>Wisconsin.</i>									
Madison	Dane	2.64	22	2.38	-0.26	7.00	1869	0.32	1883
<i>Washington.</i>									
Fort Townsend	Jefferson ...	1.85	14	2.17	+0.32	4.32	1876	0.11	1884

EXCESSIVE PRECIPITATION.

The table of excessive precipitation shows that monthly precipitation to equal, or exceed, ten inches was reported at sixteen stations in California; at seven stations in Indiana; at four stations in Kentucky; at two stations in Oregon; and at one station each in Alabama, Massachusetts, Missouri, and Tennessee. Among the heavier monthly rainfalls reported were: 19.83, at Sims, Cal.; 17.83, at Upper Mattole, Cal.; 17.58, at South Fork, Ky.; and 16.70, at Marengo, Ind.

In March of preceding years precipitation to equal, or exceed, ten inches has been reported in Alabama and California for fourteen years; in Georgia and Oregon for thirteen years; in Florida and Washington for twelve years; in Louisiana, Mississippi, New York, North Carolina, South Carolina, Tennessee, Texas, and Virginia for from five to ten years, inclusive; and in Arizona, Arkansas, Connecticut, Delaware, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Missouri, Nebraska, New Hampshire, New Jersey, Ohio, Pennsylvania, Rhode Island, Utah, West Virginia, and Wisconsin, for from one to four years, inclusive. In states and territories other than those named precipitation to equal, or exceed, ten inches has not been reported for March of preceding years. The following are among the heavier rainfalls reported for March of preceding years: Carlsville, Ala., 20.50, 1875; Fort Gaston, Cal., 34.52, in 1866; Summit, Cal., 21.05; Alta, Cal., 24.30, and Emigrant Gap, Cal., 21.69, in 1879; Cisco, Cal., 25.30, in 1882; Emigrant Gap, Cal., 22.12, in 1874; Bellevue, Nebr., 20.00, in 1882; Astoria, Oregon, 21.32, and Block House, Oregon, 22.57, in 1859; Fort Stevens, Oregon, 20.76, in 1873; Terrell, Tex., 20.12, in 1875; United States Naval Hospital, near Portsmouth, Va., 26.15, in 1867; and

Neah Bay, Wash., 23.83, in 1879. Exclusive of the years and instances cited precipitation to equal, or exceed, fifteen inches in March has been reported for six years in Washington; for four years in Oregon; for three years in California; for two years in Alabama, Illinois, and Mississippi; and for one year in Georgia, Nebraska, New Jersey, and New York.

For the current month precipitation to equal, or exceed, 2.50 inches in twenty-four hours was reported at fifteen stations in Louisiana, and on four dates, the 11th, to 14th, inclusive; in Mississippi at thirteen stations, and on five dates, the 11th to 14th, inclusive, and 27th; in California at nine stations, and on six dates, the 4th, 5th, 7th, 17th, 18th, and 20th; in Arkansas at nine stations, and on six dates, the 10th to 12th, 21st, 22d, and 31st; in Missouri at six stations, and on four dates, the 11th, 12th, 26th, and 27th; in Tennessee at six stations, and on three dates, the 12th, 13th, and 22d; in Indiana at five stations, and on four dates, the 10th to 13th; in Kentucky at five stations, and on five dates, the 10th to 13th and 22d; in Texas at three stations, and on three dates, the 12th, 13th, and 21st; in Florida at two stations, on the 25th; in Georgia at one station, on the 7-8th; in Illinois at one station, on the 10-11th; in Massachusetts at one station, on the 23d; in Minnesota at one station, on the 24-25th; in New York at one station, on the 22d; in North Carolina at one station, on the 13-14th; in Ohio at one station, on the 21st-22d; in Oregon at one station, on the 4th; and in Pennsylvania at one station, on the 29th. Among the heavier rainfalls reported for this period were: 8.00, at South Fork, Ky., on the 22d; 5.01, at Thayer, Mo., on the 10-11th; 5.00, at Lake Charles, La., on the 12-13th; 5.00, at Marengo, Ind., on the 12-13th; 5.00, at Conway, Ark., on the 21st; 4.66, at Summit, Miss., on the 14th; 4.61, at Upper Mattole, Cal., on the 20th; 4.20, at Andersonville, Ga., on the 7-8th; 4.12, at Ferndale, Cal., on the 18th; and 4.07, at Lead Hill, Ark., on the 10-11th.

In March of preceding years precipitation to equal or exceed 2.50 inches in twenty-four hours has been reported for fifteen years in Alabama; for thirteen years in Georgia; for eleven years in Florida, Louisiana, and Texas; for from five to ten years, inclusive, in Arkansas, Connecticut, Illinois, Indiana, Kansas, Massachusetts, Mississippi, North Carolina, South Carolina, and Tennessee, and from one to four years, inclusive, in California, Colorado, Dakota, District of Columbia, Iowa, Kentucky, Maryland, Missouri, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Virginia, Vermont, Washington, and Wisconsin. In states and territories other than those named, precipitation to equal or exceed 2.50 inches in twenty-four hours has not been reported for March of preceding years. The following are the heavier daily rainfalls noted for March of preceding years: Atlanta, Ga., 7.36, 29th, 1886; Okaloosa, La., 12.65, 9th, 1878. Exclusive of the instances cited, daily rainfalls to equal or exceed five inches in March have been reported for two years in Alabama, Georgia, Kansas, and Texas, and for one year in Florida, North Carolina, Tennessee, and Utah.

For the current month precipitation to equal or exceed one inch in one hour was reported at four stations in Texas, and on four dates, the 10th, 11th, 21st, and 31st; in Florida at two stations, and on two dates, the 24th and 25th; in Georgia at two stations, and on two dates, the 1st and 22d; in Illinois at two stations, and on two dates, the 27th and 28th; in Alabama at one station, on the 22d; in Kentucky at one station, on the 27th; and in South Carolina at one station, on the 28th; in Arkansas at one station, on the 21st. Among the heavier rainfalls reported for this period were: 1.75, in twenty minutes, at Howe, Tex., on the 21st; 1.56, in thirty minutes, at Merkel, Tex., on the 10th; and 1.10, in twenty-three minutes, at Shelbyville, Ky., on the 27th.

In March of preceding years precipitation to equal or exceed one inch in one hour has been reported for seven years in Texas; for five years in Florida and Tennessee; for two years in Georgia and North Carolina; and for one year in Arkansas, Kansas, Louisiana, New York, Pennsylvania, and Virginia.

In states and territories other than those named precipitation to equal or exceed one inch in one hour has not been reported for March of preceding years. The following are some of the heavier rainfalls reported for this period in March: Knoxville, Tenn., 1.08 in fifteen minutes, 12th, 1878; Kingston Springs, Tex., 1.60 in thirty minutes, 25th, 1884; Biscayne, Fla., 4.10 in thirty minutes, 28th, 1874; Terrell, Tex., 4.00 in one hour, 19th, 1876. At Greenville, Tenn., on March 27th, 1885, there was an estimated depth of 2.00 in fifteen minutes.

Table of excessive precipitation, March, 1890.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Alabama.</i>	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>h. m.</i>	
Montgomery				1.35	0 55	22
<i>Arkansas.</i>						
Arkansas City		3.00	12	2.00	1 00	21
Conway	10.46	5.00	21			
Dardanelle		2.90	31			
Forrest City		3.50	10-11			
Fort Smith		3.16	10			
Hot Springs		3.25	10			
Lead Hill		4.07	10-11			
Newport (r)		3.02	22			
Ozone		4.11	10			
<i>California.</i>						
Arcata*	11.94	2.91	3			
Boulder Creek	11.77					
Colfax	14.70					
Crescent City	13.51	2.94	17			
Delta	16.50					
El Dorado	10.04					
Eureka	11.57	2.90	4			
Felton	10.00					
Ferndale	11.23	4.12	18			
Fort Gaston	10.68					
Georgetown	14.70	2.75	5			
Do		2.80	7			
Grass Valley	14.02	2.66	4			
Iowa Hill	14.12	3.14	5			
Do		3.28	7			
Mendocino		2.70	4			
Point Reyes Light		3.30	18			
Shingle Springs	10.48					
Sims	19.83					
Summit	14.00					
Upper Mattole	17.83	3.17	5			
Do		2.67	7			
Do		4.61	20			
<i>Florida.</i>						
Fort Meade		3.40	25			
Jupiter				1.00	1 00	24
Titusville		2.52	25	1.40	1 00	25
<i>Georgia.</i>						
Andersonville		4.20	7-8	2.09	1 00	1
Monticello				1.67	1 10	22
<i>Illinois.</i>						
Centralia				1.33	0 15	28
Golconda		2.94	10-11			
Martinsville				1.10	0 25	27
<i>Indiana.</i>						
Cannelton	10.99					
De Gonia Springs	10.74					
Evansville	10.31	3.36	11			
Huntingburg	10.84	2.75	10			
Marengo	16.70	5.00	12-13			
Mount Vernon	10.19	3.52	10			
New Providence	11.17					
Princeton		2.75	10			
<i>Kentucky.</i>						
Franklin	10.53					
Louisville		2.51	10-11			
Mount Sterling	10.09	2.70	22			
Owenton		2.50	22			
Richmond		2.80	22			
Shelbyville	10.60			1.10	0 23	27
South Fork	17.58?	8.00?	22			
Do		2.50?	12-13			
<i>Louisiana.</i>						
Alexandria		4.40	12			
Cheneyville		2.57	13			
Clinton		2.62	13			
Do		2.60	14			
Convent		2.52	13-14			
Coushatta (2)		3.26	11			
Farmerville		3.75	11-12			
Girard		2.60	11-12			
Lake Charles		5.00	12-13			
Marksville		2.50	11			
Maurepas		3.00	13			
Melville		2.55	13			
Monroe		2.67	12			
New Iberia		2.50	13			
Plaquemine		4.30	14			
Vidalia		3.55	11-12			
<i>Massachusetts.</i>						
Dudley		2.60	23			
Plymouth	10.14					
<i>Minnesota.</i>						
Fort Snelling		2.85	24-25			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Mississippi.</i>	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	<i>h. m.</i>	
Agricultural College		2.80	12			
Brookhaven		3.02	13			
Canton		2.96	12			
Fayette		2.58	12			
Do		2.85	13			
Greenville		2.80	12			
Lake		2.69	13			
Lamar		4.00	14			
Natchez		3.97	12			
Do		3.27	13			
Palo Alto		2.82	13			
Rienzi		3.60	12			
Summit		4.66	14			
Do		4.20	27			
Vicksburg		2.73	11-12			
Washington		3.49	11-12			
<i>Missouri.</i>						
Centerville		4.40	10-11			
New Haven		2.50	26-27			
Oak Ridge	14.20	4.00	27			
Shelbina		2.50	26			
Springfield		2.85	10-11			
Thayer		5.01	10-11			
<i>New York.</i>						
White Plains		2.58	22			
<i>North Carolina.</i>						
Highlands		3.50	13-14			
<i>Ohio.</i>						
Hanging Rock		3.07	21-22			
<i>Oregon.</i>						
Bandon	11.65	3.08	4			
Ellensburg*	14.44	2.92	17			
Gardiner	10.12					
<i>Pennsylvania.</i>						
Blooming Grove		2.70	29			
<i>South Carolina.</i>						
Winnsborough				1.14	0 30	28
<i>Tennessee.</i>						
Clarksville	10.29					
Dyersburg		2.50	22			
Lawrenceburg		2.59	13			
Lewisburg		2.98	13			
Lynnville		2.64	12			
Springdale		2.50	22			
Trenton		3.22	22			
<i>Texas.</i>						
College Station				1.87	1 00	11
Columbia		3.40	13			
Forestburg		3.75	21			
Galveston		2.91	12-13			
Merkel				1.56	0 30	10
Palestine				1.27	1 00	31
Howe				1.75	0 20	31

Received too late for publication in February Review.

<i>California.</i>						
Dunsmuir	16.50					

* Received too late to be considered in general discussion.

MAXIMUM RAINFALLS IN ONE HOUR OR LESS.

The following table is a record of the heaviest rainfalls during March, 1890, for periods of five and ten minutes and one hour, as reported by regular stations of the Signal Service furnished with self-registering gauges:

Station.	Maximum fall in—					
	5 min.	Date.	10 min.	Date.	1 hour.	Date.
	<i>Inch.</i>		<i>Inch.</i>		<i>Inch.</i>	
Bismarck, N. Dak.	0.05	25	0.08	35	0.22	26
Boston, Mass.	0.03	21	0.05	31	0.15	21
Buffalo, N. Y.	0.15	27	0.25	27	0.55	27
Cincinnati, Ohio						
Chicago, Ill.*						
Detroit, Mich.*						
Galveston, Tex†	0.25	23	0.40	23	1.00	23
Jupiter, Fla.						
Marquette, Mich.*	0.08	28	0.15	28	0.32	22
New York City	0.15	25	0.20	25	0.30	25
New Orleans, La.	0.05	22	0.10	22	0.25	22
Norfolk, Va.	0.15	22	0.30	22	0.70	22
Savannah, Ga.	0.07	18	0.12	18	0.32	18
San Francisco, Cal.	0.30	27	0.60	27	0.70	27
Saint Louis, Mo.	0.03	22	0.05	22	0.20	22
Washington City						

* No record, snow.

† Record incomplete.

SNOW (snowfall in inches and tenths.)

The greatest depth of snowfall was reported in Nevada and Placer counties, California, along the line of the Central Pacific Railroad, where, at Summit, a total snowfall of one hundred and forty inches was noted. In the more elevated parts of west-central Colorado more than sixty inches of snow fell; in Manistee county, Michigan, more than fifty inches; in extreme southwestern Maine, southeastern New Hampshire, northeastern Massachusetts, and in Sullivan and Blair counties, Pennsylvania, more than forty inches; in northwestern Connecticut, east-central Nevada, and northeastern Vermont, more than thirty inches; in Lake county, Illinois, extreme southwestern Indiana, west-central Iowa, east-central Missouri, northern New Jersey, central New York, Rhode Island, east-central Ohio, southeastern South Dakota, northeastern Wisconsin, and northwestern Wyoming, more than twenty inches; and in central Arizona, southeastern Idaho, east-central Kentucky, northeastern Minnesota, north-central Nebraska, north-central New Mexico, central North Dakota, eastern Oregon, north-central Virginia, and central and northern West Virginia, more than ten inches. Appreciable snow fell north of a line traced from the Atlantic coast just south of Savannah, Ga., west-northwest to central Arkansas, thence northwest to south-central Kansas, thence southwest to west-central Texas, thence westward to central Arizona, thence northwest to south-central Nevada, thence southward to extreme south-central California, thence west of north to southwestern Oregon, and thence along or near the coast line to the Columbia River, and thence east of north over Washington to the British Possessions. The snowfall for the current month was heavier than for any month during the past winter in parts of New England, Pennsylvania, the Ohio and upper Mississippi valleys, and lower Michigan, and the southern limit of snow was farther south than for the winter months of 1889-1890. At Charleston, S. C., on the morning of the 2d, the snowfall was the heaviest since the establishment of the Signal Service station at that place in 1871; the snowflakes melted as they fell. On the 5th there was a heavy fall of snow in the more elevated regions of north-central New Mexico and south-central Colorado, and during the middle part of the month there were heavy snow blockades on the east side of the divide of the San Juan range of mountains in Colorado, which caused an interruption of traffic on the Rio Grande Railroad. On the 30th and 31st a heavy snow storm prevailed in central and east-central Missouri and the adjoining part of Illinois. At Saint Louis, Mo., ten inches of snow fell, and street car travel and traffic in general was suspended. In the section of Illinois referred to the snowfall varied from ten to over twenty inches, and railroad trains were delayed.

Snowfalls of ten inches or more were reported, as follows, and in states and territories where the maximum depth was below that amount, the station reporting the greatest is given:

Alabama.—Valley Head, trace. *Arizona*.—Whipple Barracks, 19. *Arkansas*.—Winslow, 5.3. *California*.—Summit, 140; Cisco, 87; Emigrant Gap, 68; Truckee, 38; Towles, 30; Boca, 26; Susanville, 14.5; Fort Bidwell, 10.2. *Colorado*.—Breckenridge, 64.5; Red Cliff, 40.2; Fraser, 36.8; Alma, 31.8; Leadville, 26; Ranch, near Como, 14.6; Watervale, 14; Durango, 12; Palmer Lake, 10.5. *Connecticut*.—Falls Village, 30; Lebanon, 27; New London, 26.2; Hartford a, 24.8; New Hartford a, 24.2; Canton, 23; Middletown, 22; Birmingham, 20; Mansfield and New Britain, 18; New Haven, 17.7; Hartford b, 17; Southington, 16.5; New Hartford b and West Simsbury, 16; Uncasville, 15; Voluntown, 13.5; Waterbury, 12. *Georgia*.—Diamond, 2.7. *Idaho*.—Soda Springs, 16.5; Era, 12; Kootenai, 10. *Illinois*.—Lake Forest, 23; Jordan's Grove, 20.5; Centralia, 18; Mount Carmel, 17; Flora, 15; McLeansborough, 14.5; Aurora, 13.9; Greenville, 11.2; Winnebago, 10. *Indiana*.—Evansville, 21; Angola, 15.8; Princeton, 15; Mount Vernon, 14.5; Marengo, 13; Huntingburgh, 11.2; Laconia, 10.5; *Iowa*.—Storm Lake, 24.8; Logan, 24; Sioux City, 23.8; Bancroft, 18; West Bend, 16.1; Wesley, 15.5; Carroll, 15.2; Hampton, 15; Larrabee, 13.8; Dubuque, 12; Manson and Vinton, 11.5; Webster, 10.8; Belle Plaine, 10.5; Clarinda, 10.2; Monticello, 10.1; Humboldt, Le Claire, and Sac City, 10. *Kansas*.—Seneca, 6. *Kentucky*.—Lexington, 13. *Maine*.—Cornish, 45; Orono, 36; Belfast and Calais, 32; Portland, 28.9; Bar Harbor and Lewiston, 28; Kennebec Arsenal, 24.5; Gardiner, 24; Farmington, 20.4; Fairfield, 17; Eastport, 15.3. *Maryland*.—Cumberland, 9. *Massachusetts*.—Croton, 40; Westborough, 36; Worcester, 34.2; Salem and Wakefield, 34; North Billerica, 33.5; Newburyport, 32; Kendall Green and Roberts Dam, 31; Leominster and South Hingham, 30; Blue Hill and Milton, 29; Fitchburgh a, Mansfield, and Manson, 28; Somerset, 27.5; Lawrence, 27; Leicester, 26.2; Andover, Fitchburgh b, Framingham, Wood's Holl, Gilbertville, and Winchester, 26; Taunton a, 25; Chestnut Hill, 24.8; Fall River and Randolph, 24; Middleborough and Mount Nonotuck, 23; Taunton b, 21.5; Boston and Springfield Armory, 20.2; Brewster, 20; Nantucket, 19; Provincetown and Wellesley, 18; Amherst Experimental Station and New Bedford a, 17; Cotuit, Ludlow, and Williamstown, 16; Plymouth, 14; New Bedford b, 13; Fort Warren, 12.8; Dudley, 12.2; Amherst and Long Plain, 12. *Michigan*.—Bear Lake, 52.5; Buchanan, 24; Benzonia, 23.5; Ivan, 22.5; East Tawas, 22.2; Hart and Weldon Creek, 21.5; Marquette, 20.1; Grand Haven, 20; Caldwell, 19; Roscommon, 17.8; Otsego and Stanton, 17.5; Berlin, 17.4; Manistee and Harrisville, 17.3; Alpena, 17.2; Alma, Bangor, and Lathrop, 17; Fort Brady, 16.4; Evart, 15.3; Atlantic and Crystal Falls, 15; Allegan, 14.4; Fremont, 14.2; Noble, 14; Arbel, 13.8; Branson, 13.5; Albion, 13.2; Cassopolis, Grayling, Parkville, and Rawsonville, 13; Hastings, 12.7; Hartford and Paw Paw, 12.5; Benton Harbor and Amadore, 12; Mottville and Thornville, 11.5; Lansing a, 11.2; South Albion, 10.5; Concord and Hudson, 10.6; Saint Johns, 10.5; Port Huron, 10.3; Fitchburgh and Calumet, 10.2; Charlevoix, Hillman, Lansing b, May, Mio, and Saint Ignace, 10. *Minnesota*.—Duluth, 10.7. *Missouri*.—Saint Louis, 21; Haven, 17; Jefferson Barracks, 15; Saint Charles a, 11; Mexico, 10. *Montana*.—Fort Maginnis, 18.1; Martinsdale, 17.3; Fort Custer, 11.9. *Nebraska*.—Valentine, 19.2; Kennedy, 17.5; Fort Niobrara, 13; Creighton, 12; Oakdale and Tekamah, 10.8; Weston, 10.5; Sargent, 10. *Nevada*.—Ruby Hill, 37; Burner's Ranch, 20.5; Tuscarora, 16.5; Austin, 15.2; Eureka, 13; Belmont, 12.5; Fenelon and Genoa, 10. *New Hampshire*.—Nashua, 42; Berlin Mills, 34; Manchester a, 33.3; Newton, 31; Antrim, Concord, Manchester b, and Plymouth, 29; Stratford and West Milan, 28; North Conway, 26; East Canterbury, 24.8; Hanover, 24.2; North Sutton, 24; Walpole, 22. *New Jersey*.—Oceanic, 25.5; Hopewell, 23; Beverly, 21.3; Newark a, 21; Princeton, 19.5; Union, 19; Newark b, 18.7; South Orange, 17; Lambertville, 16.7; Locktown, 16.2; Rancocas, 15.6; Asbury Park and Junction, 15; Madison, 14.7; Gillette and Tenaflly, 14; Imlaystown, 13.5; Moorestown, 13. *New Mexico*.—Chama, 14. *New York*.—Brookfield, 28.5; New Lisbon, 27.2; Turin, 26.5; Utica, 24.6; Oxford, 24.2; Perry City, 23.6; Constableville, 23; Wedgwood, 22.6; New York City, 21.3; Potsdam, 21; South Canisteo, 20.8; Number Four, 20.5; Cooperstown, 20; Factoryville, 19.8; Rochester, 19.2; Humphrey and Fort Wadsworth, 18.2; Port Jervis and Sherman, 18; Genoa, 17; Ilion, 16.7; Kingston and Middletown, 16.5; Queensbury, 16.2; Eden and Ogdensburgh, 16; Alfred Centre, 15.8; Boyd's Corners, 15.5; White Plains and Willets Point, 15; Fort Schuyler, 14.8; Fort Columbus, 14.5; Ithaca, 13.9; West Point, 13.7; Setauket, 13; Angelica, 12.5; Middleburgh and Pendleton Centre, 12; Davids Island, 11.5; Honeymead Brook, 11.4; Oswego, 11.3; Keene Valley, 11.2; Ardenia and Albany, 11; Fleming, 10. *North Carolina*.—Hot Springs, 4. *North Dakota*.—Steele, 13.5. *Ohio*.—Jefferson, 21.9; Carrollton, 20.5; New Alexandria, 19.3; Hiram, 17.5; Akron, 16.2; Weymouth, 15; Kent, 13.7; Bangorville, 13.1; Canton, 13; Poland, 12; McConnellsville, 11.8; Wooster, 11.6; Bellevue and Oberlin, 11.2; Marietta, 10.8; Wauseon, 10.3; Garrettsville and Orangeville, 10. *Oregon*.—Siskiyou, 23; Vernonia, 19.4; Joseph, 15.4. *Pennsylvania*.—

Blue Knob, 49; Eagle's Mere, 48.6; Grampian Hills, 33; Salem Corners, 32.8; Somerset, 30.5; Wellsborough, 29.2; Dyberry and Philipsburgh, 26.5; Le Roy and Quakertown, 26; Wilkes Barre, 24; Bethlehem and Lock Haven, 22; Girardville, 20.3; Blooming Grove and Honesdale, 20; Coopersburgh, Greenville, and Indiana, 19.8; Drifton, 19.5; Mauch Chunk, 19; Meadville and Condersport, 18; Johnstown, 17.9; Rimersburgh, 17.2; Easton and State College, 16.6; Centre Valley and Pottstown, 16.5; Charlesville, Nisbet, and South Easton, 16; Myerstown, 15.1; Meshoppen and Troy, 15; Annville, 14.6; Emporium, 14.2; Hollidaysburgh, 14; Petersburg, 13.1; Pleasant Mount, 12.8; New Bloomfield, 12.7; Uniontown, 12.6; Lewisburgh, 12.5; Carlisle and Waynesborough, 12; Coatesville, 11.8; Clarion, 11.7; Cannonsburgh and Greensburgh, 11.4; McConnellsburch and Tuscarora, 11; West Chester, 10.8; New Castle, 10.6; Tipton, 10.1; Lancaster, 10. *Rhode Island*.—Woonsocket, 26; Kingston a, Lonsdale, and Providence a, 22; Providence b, 20; Pawtucket, 19; Bristol, 16; Kingston b, 13. *South Carolina*.—Columbia, 7. *South Dakota*.—Canton, 23; Oelrichs, 15.5; Spearfish, 15; Parkston, 14.5; Alexandria, 10.8; Kimball, 10.5; Rapid City, 10.6; Yankton, 10. *Tennessee*.—Clarksville, 6.5. *Texas*.—Fort Elliott and Silver Falls, trace. *Utah*.—Levan, 4. *Vermont*.—Lunenburg, 33.5; Chelsea, 25; Jacksonville, 24; Hartland, 17; Northfield, 16; East Berkshire and Vernon, 13; Cornwall and Weatherfield Centre, 10. *Virginia*.—Dale Enterprise, 12. *Washington*.—Waterville, 6. *West Virginia*.—Seven Pines, 18; Tannery, 17.5; Oceana, 15.9; Ella, 13.5; Glenville, 11. *Wisconsin*.—Summit Lake, 23.2; Medford, 20; Milwaukee, 15.8; Phillips, 14; Horicon, 12; Delavan, 10.8; Embarrass, 10.5; Chippewa Falls, 10.2; Greenwood, Honey Creek, and Waucousta, 10. *Wyoming*.—Camp Sheridan, 28.8; Fort McKinney, 10.

DEPTH OF SNOW ON GROUND AT CLOSE OF MONTH.

Chart iv shows the depth of snow reported on the ground at the close of the month. In western upper Michigan and the adjoining part of Wisconsin, in west-central Colorado, and east-central Nevada there was a depth of thirty inches, or more; in central New Hampshire and Vermont, northwestern lower Michigan, east-central Missouri and the adjoining part of Illinois, and southeastern Idaho more than ten inches; and in north-central and northwestern Iowa, southwestern South Dakota, and south-central Montana, more than five inches. In the Atlantic coast states snow was reported on the ground as far south as southern Virginia; in the central valleys to southern Kentucky, southern Illinois, and central Kansas; in the Rocky Mountain and plateau regions in north-central New

Mexico and central Nevada. No reports of snow on the ground at the close of the month have been received from Pacific coast states. Compared with the preceding month the southern limit of snow on the ground at the close of the respective months was about the same, save over the eastern part of the country, where on February 28th no snow was reported in the Atlantic coast states south of New Hampshire and Vermont, save trace in extreme northeastern Pennsylvania.

HAIL.

Descriptions of the more severe hail storms of the month are given under the head of "Local storms." Hail was reported as follows: 1st, Md., N. J., N. Y., N. C., Oregon, Va. 2d, Oregon. 3d, La. 4th, Ark., Ill., Ohio. 5th, Colo., La., N. J. 6th, N. J., Pa. 7th, Nev., Oregon. 8th, Cal., Nev., Oregon. 9th, Cal., Kans., Mo., Nev., Oregon, S. Dak., Wash. 10th, Ill., Ind. T., N. C., Oregon, Wash. 11th, Tex. 13th, Tex. 14th, Ala., N. Y., N. C., Ohio, Pa., Va. 15th, N. C., Va. 17th, Ohio. 18th, Ark., Ill., Ind., Ky., Mo., N. Y. 19th, Cal., Colo., Ohio, Tenn. 20th, Ariz., Ark., Ill., Mo., Ohio, S. C. 21st, Colo., Ga., La., Mont., N. Y., Tenn., Va. 22d, Ga., Ind., Ky., Md., N. Y., N. C., Ohio, Oregon, S. C., Tenn. 23d, Ga., Oregon, Utah. 25th, Cal., Oregon, Pa., Tenn. 26th, Cal., Idaho, Ill., Mo., Nev., Ohio, Oregon, Tenn., Wash. 27th, Ill., Ind., Iowa, Ky., Mich., Mo., N. Y., Ohio, Tenn. 28th, Ill., Mass., Mich., N. J., N. Y., Ohio, Pa. 29th, Cal., Mo., Oregon, Utah. 30th, Ark., Cal., Colo., Kans., Ky., Mo., Nev., N. J. 31st, Kans., La., Mo., N. J., Tex., Utah.

SLEET.

Sleet was reported as follows: 1st, Conn., D. C., N. J., N. Mex., N. C., Wash. 2d, Mont., N. J., S. C. 3d, Wash. 4th, Pa., Wash. 5th, Kans., Mo., Nebr., Pa., Tenn. 6th, Ark., Colo., Conn., Nebr., N. J., N. Y., Tenn., Tex. 7th, Ala., Colo., Ga., Miss., S. C., Tenn. 8th, Cal., W. Va. 9th, Cal., Ill., Iowa, Mo., S. Dak. 10th, Cal., Colo., Ind., Iowa, Ky., N. C., Ohio, Oregon, Tenn., Wash. 11th, Wis. 14th, Ala., Miss., N. C., Ohio, Pa., Tenn. 15th, N. C. 17th, Va. 19th, Minn., Ohio, Pa. 20th, Minn., Ohio, Wis. 21st, Minn., Mont., Ohio, Wis. 22d, Ala., N. Y., N. C., Pa. 23d, Ill., Wis. 24th, Minn., Mont., Ohio, S. Dak., Wis. 25th, Conn., Iowa, Minn., N. Y., Pa., Wis. 26th, Cal., Iowa, Minn., Ohio. 27th, Colo., Ill., Ind., Iowa, Ky., Nebr., Ohio, Pa., W. Va. 28th, Conn., Ill., Mass., Nebr., N. H., N. Y., Ohio, Pa. 29th, Ill., Ky., Mass., N. Y., Ohio. 30th, Kans., Ky., Mo. 31st, Kans., Mo., Pa., Va., W. Va.

WINDS.

The prevailing winds during March, 1890, are shown on chart ii by arrows flying with the wind. In New England, the upper lake region, and the upper Mississippi valley the winds were mostly from the northwest; in the south Atlantic states from south to west; in the west Gulf states from northeast to southeast; in the Rio Grande Valley from the south; in the Ohio valley and Tennessee, the lower lake region, the southern and middle plateau regions, and the middle Pacific coast from southwest to northwest; in the Missouri Valley from north to northwest; over the middle-eastern slope of the Rocky Mountains from north to east; over the northern plateau region and along the north Pacific coast from southeast to southwest; along the south Pacific coast from west to northwest; in the middle Atlantic states from the northwest, except in the southern part, where south to southwest winds prevailed. In Florida, the east Gulf states, the extreme northwest, and over the northeastern and southeastern slopes of the Rocky Mountains the winds were variable.

HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour were

reported at regular stations of the Signal Service as follows: 2d, 54, n., at Block Island, R. I.; 50, n., at Hatteras, N. C. 7th, 68, se., at Fort Canby, Wash. 8th, 54, se., at Fort Canby, Wash.; 60, sw., at Winnemucca, Nev.; 54, n., at Hatteras, N. C. 9th, 50, s., at Moorhead, Minn. 10th, 54, w., at Fort Stanton, N. Mex. 16th, 50, nw., at Hatteras, N. C. 19th, 60, ne., at Block Island, R. I. 23d, 50, s., at Dodge City, Kans. 24th, 53, nw., at Bismarck, N. Dak.; 60, nw., at Fort Buford, N. Dak. 25th, 66, w., at Chicago, Ill.; 50, nw., at Valentine, Nebr.; 54, nw., at Bismarck, N. Dak. 26th, 60, w., at Pueblo, Colo.; 55, w., at Whipple Barracks, (Prescott) Ariz. 27th, 50, s., at Lexington, Ky.; 50, ne., at Milwaukee, Wis.; 58, w., at Cairo, Ill.; 60, nw., at Springfield, Mo.; 54, nw., at Wichita, Kans.; 60, nw., at Fort Sill, Ind. T.; 68, ne., at Chicago, Ill.; 62, n., at Dodge City, Kans.; 60, w., at Saint Louis, Mo. 28th, 57, ne., at Chicago, Ill.; 58, nw., at Saint Louis, Mo.; 62, nw., at Lexington, Ky.

LOCAL STORMS.

On the 11th a tornado passed over the village of Excelsior, Ark., fifteen miles south of Fort Smith, Ark., demolishing

houses, and injuring several persons. On the 21st a damaging wind and rain storm occurred at Howe, Tex.; 1.75 inch of rain fell in twenty minutes, and considerable damage was done to crops, etc. On the 22d, at about 1.30 p. m., three small tornadoes developed about twenty miles southwest of Thomson, Ga., all of which moved in parallel lines from southwest to northeast, and from one to ten miles apart. In their progress the cone-shaped clouds dipped to the ground in places, then rose and passed on without touching the ground for distances varying from two to six miles. Many houses and much timber were levelled. A storm moving from the southwest struck Concord, N. C., nine miles west of Mount Pleasant, N. C., at about 3 p. m., damaging dwellings and other buildings. A severe storm, which cut a swath about one-fourth of a mile wide through forests and fields, demolishing buildings, leveling heavy standing timber, and killing live stock, was reported in Bertie county, N. C. A violent storm swept over the northern, western, and central parts of South Carolina, and several persons were reported killed by falling houses. The railroad bridge over the Broad River near Spartanburgh was blown from its piers. The storm was very severe in Florence, Spartanburgh, Newberry, Charleston, and Edgefield counties.

On the night of the 27th a remarkable series of tornadoes occurred in Kentucky, southern Indiana, southern Illinois, and southeastern Missouri, in the southeast quadrant of a low pressure storm of great energy, which is described under the heading "Areas of low pressure" as number xi, and within three hundred miles of its centre. While the clearly-defined tornadoes were confined to the sections above referred to, heavy storms prevailed in Colorado, Kansas, Nebraska, and thence eastward over the Ohio Valley and the Lake region, and in Tennessee, but no lives were lost between the Missouri River and the Rocky Mountains. The total loss of life apart from Louisville, Ky., where seventy-six persons were killed, cannot be definitely determined. Reports indicate, however, that in addition to the large number of persons injured, over one hundred lives were lost in Kentucky, and the aggregate valuation of property losses was nearly \$4,000,000, of which Louisville sustained about \$2,500,000. In Indiana the principal losses were sustained at Jeffersonville, where many buildings were demolished, without, however, an attendant loss of life. In Illinois seven lives are known to have been lost and many persons were injured, and the loss to property is estimated at over \$200,000. In Missouri but four lives were reported lost, and the damage to property was not large. The general meteorological conditions at 8 a. m. and 8 p. m. (75th meridian time) of the 27th are shown on charts v and vi, and the paths of the principal low pressure storm, within whose area the tornadoes occurred, and the approximate paths of tornadoes are shown on chart vi.

Sergeant Frank Burke, observer, Signal Corps, has made the following report relative to the tornado which visited Louisville, Ky., and vicinity on the night of March 27, 1890, the observations being taken on 75th meridian time:

March 27th opened with light rains which continued in showers at frequent intervals until 3.40 p. m., with temperature about stationary at 50°, a brisk southeast wind, and rapidly falling barometer. About 7 p. m. the heavy cumulus clouds which covered the sky showed signs of dispersion, diminishing in density and becoming uncertain in their movements, which up to that hour had been a moderately rapid one from the southeast. At 8 p. m. the clouds were heaped into great masses of a grayish yellow color, but this time in the southwest, and with a very rapid motion from that quarter. Simultaneously a heavy bank of what appeared to be ordinary summer thunder clouds, except for their extreme blackness, appeared in the northwest. The bank of clouds gradually extended itself along the western horizon, until at a point near the centre of the southwest quadrant it merged into the cloud masses moving from the southwest. At this time, 8.30 p. m., although the intense darkness precluded a careful observation of their movements, the clouds in the southwest exhibited evidence of a most violent commotion. It appeared as though the northwest and southwest clouds in coming into contact had been shattered to pieces, and their fragments intermingling had been thrown upward and laterally by the force of the shock. The movements described occurred at a considerable elevation, the space intervening between the clouds and the earth being occupied by a misty or fog-like condition. Heavy rain began almost at the moment of the occurrence of the commotion referred to. At the same

time the lightning flashes, which had occurred hitherto only at long intervals, increased ten-fold in frequency and intensity, the southwest quarter of the heavens being the centre from which the almost incessant flashes radiated. A peculiar feature of the electrical display was the almost entire absence of thunder. The temperature, which since 5 p. m. had been gradually rising, was now 68°; although this record did not by any means indicate the apparent heat and oppressiveness of the atmosphere. The wind had been blowing a moderate breeze from the southeast during the afternoon; at 8.34 p. m. it shifted suddenly to the southwest and increased in force. At 8.50 p. m. the rain had almost ceased; a few moments later scattering hail-stones fell, the average diameter of which was about one-half inch; then came a momentary lull in the wind, and a peculiar indescribable oppressiveness of the atmosphere. The darkness was intensified at this moment by the sudden diminution of the gas jets, which in many cases were entirely extinguished. It may be important to state in this connection that the jets were not blown out, but failed through lack of pressure in the reservoir.

The approach of the tornado was heralded by a tremendous roaring sound, mingled with the crash of falling buildings. The noise has been likened to that produced by the passage of a heavy train of cars over a bridge, a thousand times intensified. The storm struck the city at 18th street and Broadway, crossed it in an almost due northeasterly direction, and left it at 7th and Water streets. The exact moment it passed the last-named point was 8.57 p. m. This record is verified by the statement of the Western Union officials who noted this as the moment when their wires, which cross the tornado's track, ceased to work. The time occupied by the tornado cloud in passing a given point did not exceed three-fourths of a minute? and, as the average width of its path through the city was about three hundred yards, it advanced at the rate of about 36 to 40 miles an hour. This estimate is approximately verified by noting the stopping time of clocks found at various points in the ruins. The persons who saw the tornado cloud coincide in their statements that it was of a balloon or turnip shape. The darkness and confusion at the time precluded accurate observation of its movements. It was accompanied by a most terrific electrical display, and several reliable persons assert that balls of fire were playing about it. The highest wind-velocity recorded at the Signal Office during the passage of the tornado was thirty-six miles an hour. This is remarkable, considering the fact that its path was less than six hundred yards from the office. After it had passed the wind shifted suddenly to the west and continued to blow from that point during the succeeding twenty-four hours, and with increasing velocity, the record showing forty-two miles an hour at 10 p. m. The sky was perfectly clear at 10.30 p. m., with the exception of a streak of very high and apparently motionless cirrus clouds in the west. Shortly after this time the atmosphere became obscured by a peculiar haze or smoke, through which the moon shone with a reddish light. These conditions were followed by the formation of heavy cumulus clouds in the west, which had a rapid easterly movement and soon covered the entire sky. Immediately after the passage of the tornado the temperature fell suddenly; at midnight it was 48°, and before morning a minimum of 39° was recorded. The path of the tornado has been traced from about eight miles southwest of the city limits on the south bank of the Ohio River to the southern part of Carroll county, a distance of about seventy-five miles. Throughout the entire distance it preserved a nearly uniform width of three hundred yards, although for short spaces contractions to two hundred yards or less, and expansions to more than five hundred yards were noted. Its course was nearly due northeast and the track showed few of the sinuosities common to such storms.

At the point where the tornado entered the city the width of the path of destruction was a little more than two hundred yards. As the tornado cloud progressed the diameter of its path increased, until at the river it had extended sufficiently to embrace the upper part of Jeffersonville on the north bank and the Louisville City Water Works on the south bank, which would indicate a width at that point of over five hundred yards. There is no evidence that the tornado cloud touched the ground at any point in its course through Louisville. This is shown by the fact that in nearly every case the destruction was confined to the upper floors of the demolished buildings, but comparatively few houses being totally ruined, and also by the circumstance that a large proportion of the one story structures in its path were uninjured. Most of the wrecked buildings owed their destruction to the collapsing of their walls from the weight of the debris of the ruined upper floors. Churches, halls, warehouses, and other structures having but little interior support suffered the most. To this fact is attributed the principal loss of life. At the Falls City Hall, alone, where a large number of people had congregated, forty-four persons were killed. Frame buildings invariably withstood the shock much better than those constructed of masonry. But few of the destroyed buildings bear evidence of being actually blown down by the whirl of the tornado cloud itself, but their destruction was apparently caused rather by a lateral or vertical rush of air currents centering toward it. The ruins and the disposition of the debris give ample evidence of this. The right side of the storm track, and in a less marked degree the left side, afforded numerous examples of the intensity of the lateral force referred to. In both cases the sides of the buildings facing the storm were pulled out, the debris falling towards it. In many cases fragile articles, such as glassware, remained undisturbed and uninjured. In the centre of the track the destruction was mainly due to a vertical force which lifted the roofs of the buildings. The Union Depot affords an excellent example of this. This building was nothing more than a well-constructed car shed about two hundred feet long and one hundred feet wide, composed entirely of iron. The roof was lifted bodily and deposited intact on the floor, immediately beneath its original location.

The destroyed buildings were, as a rule, of a very unsubstantial character, being mainly ordinary brick dwellings, small stores, and warehouses. The Fort Nelson Building, at 7th and Main streets, is the most notable exception to the general destruction which marked the path of the tornado. This structure is a well-constructed six-story building, and by its greater height than those surrounding it was more exposed to the storm's fury. Despite the fact that it was directly in the storm's track, and that all other houses on either side were wrecked, it escaped with the loss of its windows. The gyratory motion of the tornado is well illustrated in the disposition of the prostrated trees in the parks and in the timber through which it passed before entering the city. In the centre the trees were piled in promiscuous heaps, denoting a tremendous wrenching or twisting force; on the right side the tree tops point almost northeast; those on the left side, nearer due east. Throughout the path of the storm the zone of destruction on the right side is more than twice as wide as that on the left side, and shows a much greater intensity of force.

The Louisville tornado was but one of a group of such storms which occurred in the state that night. The work of investigating them with a view to determining their location and extent was a peculiarly difficult one. Violent atmospheric disturbances were prevalent throughout Kentucky that night, and many correspondents who were unfamiliar with the characteristics of the tornado proper reported the occurrence of such storms, when in reality they were deceived by unusually severe thunder-storms, accompanied by destructive winds. From the mass of testimony received it has been possible to trace, conclusively, the paths of at least five true tornadoes in Kentucky on the night of March 27th. Each of these storms resulted in loss of life and great destruction of property. In Louisville seventy-six persons were killed, two hundred injured, and \$2,500,000 worth of property destroyed. Outside of the city, including Jeffersonville, Ind., thirty persons were killed, fifty injured, and \$1,000,000 worth of property destroyed. That many lives and an immense amount of property on the river were not lost was due entirely to warnings sent out from the Signal Office on the morning of the 27th. Steamboats, coal fleets, and other craft lying in the harbor were secured by double moorings and were thereby enabled to withstand the force of the storm. River men estimate the value of property thus saved at about \$100,000."

Tornadoes were also reported on this date as follows:

A tornado passed northeastward over the southwest part of Webster county, Ky., its path being about thirty-two miles long and one-fourth to three-fourths of a mile wide. Fifteen persons were killed; sixty dwellings and a large number of outhouses destroyed; and property damaged to the extent of about \$200,000. Within a radius of seven miles of Kuttawa,

Lyon Co., Ky., four persons were killed; a number injured; and \$15,000 damage done to property. At Bremen, Muhlenberg Co., Ky., several persons were injured; eight houses were swept away and a large number wrecked or unroofed; and the damage to property was about \$20,000. A report from Marion, Crittenden Co., Ky., states that in that county three persons were killed and eighty injured, and that the loss to property amounted to about \$75,000. At Eddyville, Lyon Co., Ky., two persons were killed, and the loss by damage to property was about \$12,000. Considerable loss of life and destruction of property was also reported in Christian, Laurel, Henry, Trigg, Barren, and Henderson counties, Ky. At Metropolis, Massac Co., Ill., one person was killed; about fifty injured; and the damage to property aggregated about \$150,000. At Poplar Ridge, near Murphysborough, Jackson Co., Ill., two persons were killed, and the loss to property was about \$3,000. At Grand Tower, Jackson Co., Ill., four persons were killed; about sixty injured; and \$40,000 to \$50,000 worth of property was destroyed. A tornado passed northeastward over Olney, Richland Co., Ill., injuring five persons, wrecking thirty-two houses, many stables, and damaging property to the extent of nearly \$50,000. A destructive tornado was reported in the lower part of Pope county, Ill., and a well-defined tornado was reported in Clay county, Ill. Heavy wind storms, generally attended with hail of unusual size, passed over Winnebago, Washington, Union, Randolph, Cook, and Alexander counties, Illinois. Furious storms prevailed over southern Indiana. A tornado passed over the southeastern part of Missouri, killing four persons at Hoff's Station, and injuring several others. In Tennessee the storm was very severe in the western and the northern and southern parts of the middle section of the state. The counties of Sumner and Lincoln seem to have suffered most. In the former several lives and an immense amount of property were lost, and in the latter it was particularly severe in and around the town of Fayetteville, where many buildings were demolished and several lives were lost. In other portions of the state much damage was done to buildings, etc.

INLAND NAVIGATION.

FLOODS.

Excessive rainfall over a great part of the vast water-shed between the Alleghany and Rocky Mountains for the first three months of 1890 furnished a surplus of water that the outlets of the lower Mississippi valley could not discharge, and caused one of the greatest floods on record along the lower Mississippi river. At most important points the water was the highest known, but the levees were in better condition than during great floods of preceding years, and many of the more important levees were firm and in good condition at the close of the month. From January to March, 1890, inclusive, the precipitation in the Ohio Valley and Tennessee was about one-half greater, and in the upper Mississippi valley and the west Gulf states about one-fourth greater than the average precipitation in those regions for the months named. In other sections drained by the Mississippi River and its tributaries the precipitation for the period referred to was deficient. The levee system for the protection of land lying along the lower Mississippi river was commenced with the founding of New Orleans, and this work has been carried on as the necessity for protecting the fertile and rapidly improving sections of the lower Mississippi valley from inundation became apparent, and in 1850, by the concentration of national and state resources, the gigantic work of leveeing the Mississippi River northward to southern Missouri was systematically begun. The inadequacy of this great system to afford complete protection during extreme flood conditions was demonstrated during 1858 and 1859, when the water was above the danger-line during one hundred and fifty-nine days, and thirty-two crevasses occurred from the mouth of the Saint Francis River to Bonnet Carre, La. Other

great floods during which levees were broken and considerable sections of country were inundated occurred in the lower Mississippi in 1862, 1874, 1882, and 1884, the overflowed area in 1882 being about thirty thousand square miles.

The following is a list of the crevasses which occurred in the lower Mississippi levees during March, 1890, with the rise and fall and the stage of water at the more important points from which reports have been received:

On the 1st the stage of water at Cincinnati, Ohio, was 57 feet, and the river had risen 15 feet in five days; at Cairo, Ill., the stage of water was 42.2 feet, and the river had risen 8 feet in five days; at Chattanooga, Tenn., the stage of the water was 40 feet, and it had risen 30 feet in five days; at Nashville, Tenn., the stage of water was 47 feet, and it had risen 34 feet in six days; at Saint Louis, Mo., the stage of water was 8.5 feet, and it had been stationary; at Vicksburg, Miss., the stage of the water was 46.3 feet, and at Little Rock, Ark., 19 feet. The gauge reading at New Orleans, La., was 15.5 feet on the 1st and 2d. On the 4th the river reached the danger-line, 34 feet, at Memphis, Tenn. On the 9th a crevasse occurred in Sappington Hook levee, which is situated in Desha Co., Ark., about six miles above Arkansas City. Adjacent plantations were flooded but no loss of life occurred. At the close of the month this crevasse was about six hundred feet wide. The levee at Alsatia, La., about thirty-eight miles above Vicksburg, Miss., also broke. The stage of the water at Vicksburg on this date was 46.9 feet and rising; at Helena, Ark., 43.3 feet and rising. On the 11th the gauge reading at New Orleans, La., was 16.2, the high-water mark of 1874. On the 12th an extensive break occurred in the main levee at Alsatia, La. On

this date the stage of water at Cairo, Ill., was 48.8 feet, and the water had risen 0.5 foot in twenty-four hours, and 1.0 foot in four days. There had been a rise of 7.0 feet at Cincinnati, Ohio, and a rise of 1.0 foot at Saint Louis, Mo., in twenty-four hours, and there had been a fall of 8.0 feet at Chattanooga, Tenn., and a fall of 1.0 foot at Nashville, Tenn. The stage of the water at Memphis, Tenn., was 36.0 feet and rising; at Helena, Ark., 43.4 feet and rising; at Vicksburg, Miss., 47 feet and rising; at Natchez, Miss., 46 feet; at Red River Landing, La., 43.7 feet; at Baton Rouge, La., 34 feet; and at New Orleans, La., 16.2 feet and stationary. The Arkansas River at Little Rock, Ark., was 16.1, a rise of 6.5 in twenty-four hours. On the 13th the river rose to 17 feet on the gauge at New Orleans, La., in the afternoon. This was the highest stage of water ever known at that place; it was 9.5 inches above the high-water mark of 1874, and 7 inches above the stage of the 12th. The banks of the river fronting New Orleans were overflowed, and the water flooded the streets until 11 p. m., without, however, causing material damage. After this date the river at New Orleans continued nearly stationary between 16.5 and 16.9 feet until the 21st, after which it fell very slowly until the 31st, when the gauge readings were 15.9 to 16 feet.

At 10 p. m. of the 13th a crevasse one hundred and fifty feet wide occurred at Nita Plantation, 62 miles above New Orleans, La., which widened to six hundred and fifty feet by the close of the month. Twenty feet of levee gave way at Plattenville, on the east bank of Bayou La Fourche, and the levee broke at Mayersville, Miss., about sixty-six miles above Vicksburg. At Memphis, Tenn., the gauge reading was 36.5, feet, 0.1 foot higher than ever before reported at that place, and the river was reported fifty miles wide in many places between Memphis and Cairo, and at Vicksburg, Miss., the stage of the water was 47.6 feet and rising. On the 14th the Mississippi was rising from Memphis to the Gulf; a break one hundred feet wide occurred in the levee on the east bank of the river twelve miles below Donaldsonville, Saint James Parish, La., and the levee broke at Bohemia, south of New Orleans. Newport, Ark., was flooded, and about 75,000 acres of cultivated land in the adjacent county were under water. The White and Black rivers were falling. At Memphis the stage of the water was 36.4 feet and rising; at Helena, Ark., 44.1 feet and rising; at Vicksburg, Miss., 47.8 feet and rising; at Natchez, Miss., 46.5 feet; at Red River Landing, La., 44.7 feet; at Baton Rouge, La., 35.2 feet; and at New Orleans, 16.5 feet and rising. At Memphis, Tenn., the river reached an extreme height of 36.6 feet on this date, the highest water on record at that place, and the whole country on the Arkansas side of the river from Memphis, Tenn., to Helena, Ark., was reported submerged. On the 15th a crevasse occurred at Pecan Grove, La., about thirty-three miles above Vicksburg, and overflowed portions of East Carroll and Madison Parishes, and large tracts of land southward to the Red River. This was the largest crevasse that occurred during the month, being fully fifteen hundred feet wide. On this date the stage of water at Helena was 44.2 feet, and rising; at Vicksburg, 48 feet and rising; at Natchez, Miss., 46.9 feet; at Red River Landing, La., 44.9 feet; at Baton Rouge, La., 35.2 feet; and at New Orleans, 16.6 feet and rising. On the 16th the river began to fall at Vicksburg, the gauge reading being 47.6 feet; at Cairo the stage of the water was 48.3 feet, a rise of 0.1 of a foot; the Ohio River fell 0.6 of a foot at Paducah, Ky.; at Memphis the river was stationary at 36.6, and the backwater along Wolf River and Bayou Gayoso spread over considerable territory; at New Orleans the stage of the water was 16.7 feet and rising; at Natchez, Miss., 46.9 feet; at Red River Landing, La., 45.0 feet; and at Baton Rouge, La., 35.4 feet. On the 17th the stage of water at Memphis was 36.6 feet and falling; at Arkansas City, 48.6 feet; at Vicksburg, 47.7 feet and falling; at Natchez, Miss., 46.7 feet; at Red River Landing, La., 45.1 feet; at Baton Rouge, La., 35.4 feet, and at New Orleans, La., 16.5 feet and rising. On the 18th a crevasse occurred at Offutt,

Washington Co., Miss., about sixteen miles above Greenville, Miss. The gauge at Greenville read 43.5 feet on the 17th, and fell 0.3 of a foot by the 20th. A break also occurred at Luna, Ark., about thirty miles below Arkansas City. The water ran through what is known as Boeuf Cut Off, and the water rose steadily at Girard, La., on the Boeuf River. On this date the stage of water at Memphis was 36.4 feet and falling; at Helena, Ark., 44.5 feet and rising; at Arkansas City, 48.7 feet; at Vicksburg, 47.5 feet and falling; at Natchez, Miss., 46.4 feet; at Red River Landing, La., 45.1 feet; at Baton Rouge, La., 35.4 feet; and at New Orleans, La., 16.6 feet and rising.

On the 20th the levee broke at Jesuit Bend, Plaquemine Parish, La., at 1 a. m. The stage of the river at Memphis was 36.4 and falling; at Arkansas City 48.7 feet; at Helena 44.9 feet and rising; at Vicksburg 47.2 feet and falling; at Natchez, Miss., 46.2 feet; at Red River Landing, La., 45.1 feet; at Baton Rouge, La., 35.3 feet; and at New Orleans 16.6 feet and steady. On the 25th the levee broke about one and one-half miles above Arkansas City, the break being one hundred and fifty feet wide. The gauge reading at Arkansas City was 49.05 on this date, and the river fell 0.4 foot in three days. The stage of the water at Memphis on the 25th was 36.6 and rising; at Helena, 46.7 and rising; at Vicksburg 46.9 and falling; at Natchez, Miss., 45.8 feet; at Red River Landing, La., 45.0 feet; at Baton Rouge, La., 35.1 feet; and at New Orleans 16.2 feet and falling. On the 26th the levee broke at Skipwith, sixty miles above Vicksburg, the break being six hundred feet wide, and a break occurred at Live Oak, twenty-six miles below New Orleans, which widened on the 27th. On this date the stage of the water was 36.4 and falling at Memphis; 49.22 feet at Arkansas City and rising; 47.1 feet at Helena and rising; 46.8 feet at Vicksburg and falling; at Natchez, Miss., 45.8 feet; Red River Landing, La., 45.0 feet; Baton Rouge, La., 35.0 feet; and 16.2 feet at New Orleans and stationary. On the 27th a break occurred in the levee at Laconia, sixty-five miles above Arkansas City. At Helena the stage of the water was 47.4, only 0.7 foot below the highest water ever reached, and the river had risen 2.0 feet in ten days. At Arkansas City the river was 2.2 feet above the high water of 1884. At Memphis the stage of water was 36.6 feet and rising; at Vicksburg 46.7 feet and falling; at Natchez, Miss., 45.8 feet; at Red River Landing, La., 45.0 feet; at Baton Rouge, La., 34.9 feet; and at New Orleans 16.2 feet and stationary. On the 28th a crevasse three hundred feet wide occurred at Columbia, Ark., about thirty-one miles below Arkansas City, and a crevasse three hundred feet wide at Easton, Miss., four miles above Arkansas City, and a crevasse two hundred and fifty feet wide occurred at Huntington, Miss. On this date the stage of water at Memphis was 36.6 feet and stationary; at Helena 47.6 feet and rising; at Vicksburg 46.6 feet and falling; at Natchez, Miss., 45.8 feet; at Red River Landing, Miss., 45.0 feet; at Baton Rouge, La., 34.9 feet; and at New Orleans, 16.1 feet and falling. On the 29th the stage of the river at Memphis was 36.4 feet and falling; at Arkansas City, Ark., 48.8 feet; at Helena, 47.7 feet and rising; at Vicksburg, 46.6 feet and stationary; at Natchez, Miss., 45.6 feet; at Red River Landing, La., 45.0 feet; at Baton Rouge, La., 34.9 feet; and at New Orleans, 16.1 feet and stationary. On the 30th the levee broke at Austin, Miss., fifty-eight miles below Memphis. On this date the stage of the water at Memphis, Tenn., was 36.2 feet and falling; at Arkansas City, 48.7 feet and falling; at Helena, Ark., 47.7 feet; at Vicksburg, Miss., 46.4 feet and falling; at Natchez, Miss., 45.5 feet; at Red River Landing, La., 45.0 feet; at Baton Rouge, La., 34.8 feet; and at New Orleans, 15.9 feet and falling. On the 31st the protection levee at Greenville, Miss., gave way and the lower part of the town was inundated. The Ohio River was rising at Cairo, and the Mississippi River began to rise at Memphis, owing to the flood from the Ohio River. On this date the stage of the river at Memphis was 36.2 feet; at Arkansas City, 48.5 feet and falling; at Helena, 47.6 feet and falling; at Vicksburg, 46.3 feet and falling; at Natchez, Miss., 45.5 feet; at Red

River Landing, La., 44.9 feet; at Baton Rouge, La., 34.8 feet, and at New Orleans, 15.9 feet and falling.

The Signal Service observer at Memphis, Tenn., reports that the changes in the stage of the water at Cairo, Ill., were felt at Memphis in about sixty hours, a rise of 2.35 feet at Cairo being followed by a rise of 1.0 foot at Memphis. The Signal Service observer at Vicksburg, Miss., reports that, excluding Austin crevasse, the crevasses on the Mississippi side flooded the greater part of Washington, Sharkey, and Issaquena counties, and portions of Bolivar and Sunflower counties, and that, while the damage to property and stock was very great, no estimate of the losses could be formed at the close of the month. The Signal Service observer at New Orleans, La., reports that the damage from the Nita crevasse was great. The Mississippi Valley Railroad property at that point was submerged, and great damage was done to the cane crop. About three-fourths of the water from the Nita crevasse found its way into Lake Pontchartrain through the passes at Manchac, one of which was about nine hundred feet and the other about twenty-four hundred feet wide, with an average depth in both of about ten feet. Most of the plantations suffering were those fronting on the river.

Along the Ohio River and its tributaries flood conditions prevailed throughout the month; houses, barns, etc., in low lying districts were washed away; railroad and river traffic was interrupted, and bottom lands were flooded, causing heavy losses and much suffering. At Cincinnati, Ohio, the river rose very rapidly to a maximum height of 59.2 feet from 11 p. m. of the 25th to 4 a. m. of the 26th, the highest point reached since February, 1884, when the stage of the water was 71 feet.

At the close of the month the outlook in the lower Mississippi valley was discouraging. In addition to the danger and damage feared from water, the stock left in the valleys were being tortured by the regular attendant of high water, the Buffalo gnat. The Ohio and Mississippi rivers were generally falling, except at Cairo, Ill., where the river was rising, and at New Orleans, La., where the river was stationary. The water was 1.6 foot above the danger-line at Cincinnati, Ohio; 7.7 feet above at Louisville, Ky.; 6.6 above at Paducah, Ky.; 8.1 above at Cairo, Ill.; 0.4 above at Memphis, Tenn.; 10.6 above at Helena, Ark.; 5.3 above at Vicksburg, Miss.; and 2.9 above at New Orleans, La.

OPENING OF NAVIGATION.

Lake Ontario.—A schooner arrived at Oswego, N. Y., on the 24th; this was the first arrival of the season at that port.

Lake Erie.—A steamer left Toledo, Ohio, for Erie, Pa., on the 24th; this was the first departure of the season from Toledo. Several vessels left Sandusky, Ohio, on the 17th, opening navigation at that port for the season. A steamer left Cleveland, Ohio, for Detroit, Mich., on the 3d; this was the first departure of the season from that port. A propeller arrived at Buffalo, N. Y., from Toledo, Ohio, on the 31st; this was the first arrival of the season at Buffalo.

Lake Huron.—A schooner arrived at Port Huron, Mich., from Alpena, Mich., on the 23d; this was one of the earliest

passages on record. Navigation between Port Huron and Detroit, Mich., began for the season on the 24th, when the steamer "Ossifrage" resumed her trips. A steamer on her way to Alpena, Mich., touched at Port Huron on the 30th, and navigation on Lake Huron was considered open for the season on that date.

Connecticut River.—On the 13th there was considerable floating ice in the river at New London, Conn., but steamers were making regular trips.

Hudson River.—On the 20th a steamer arrived at Albany, from New York City; this was the first arrival of the season at Albany; and the boats of the Schuyler Towing Company were on their way up the river with their first tow of the season.

Thunder Bay and Thunder River.—The river and bay froze over on the 5th, closing navigation until the 31st, when a steamer arrived at Alpena, Mich., from Detroit, Mich. The steamer left for northern ports on the same date.

Mississippi River.—A steamer arrived at La Crosse, Wis., on the 31st; this was the first arrival of the season at that port. On the 19th the ice in the river at Dubuque, Iowa, broke, opening navigation at that point.

STAGE OF WATER IN RIVERS AND HARBORS.

The following table shows the danger-points at the several stations; the highest and lowest water during March, 1890, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, March, 1890 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La.	29.9	22, 23, 24	28.0	1	21.4	6.6
Arkansas River:						
Fort Smith, Ark.	22.0	12	21.0	31	4.6	16.4
Little Rock, Ark.	23.0	14	22.3	11	9.6	12.7
Missouri River:						
Ft. Buford, N. Dak.*						
Kansas City, Mo.	21.0	22	9.3	1, 2	1.5	7.8
Mississippi River:						
Saint Paul, Minn.	14.5	28	3.0	13	1.8	1.2
La Crosse, Wis.	24.0	21	4.5	27	2.9	1.6
Dubuque, Iowa	16.0	23, 24	4.5	31	3.6	0.9
Davenport, Iowa	15.0	16	5.1	31	3.0	2.1
Keokuk, Iowa	14.0	16	5.6	1	1.1	4.5
Saint Louis, Mo.	32.0	29	15.2	8	4.7	10.5
Cairo, Ill.	40.0	12, 13	48.8	1	42.1	6.7
Memphis, Tenn.	34.0	14 to 17, 23 to 28	36.6	1	32.6	4.0
Vicksburg, Miss.	41.0	15, 16	48.0	1, 2, 3, 4, 31	46.3	1.7
New Orleans, La.	13.0	13	17.0	1, 2	15.5	1.5
Ohio River:						
Pittsburgh, Pa.	22.0	23	24.3	9	4.8	19.5
Parkersburg, W. Va.	38.0	25	35.0	10	8.4	26.6
Cincinnati, Ohio	50.0	26	59.2	11	23.3	35.9
Louisville, Ky.	25.0	28	35.5	10	10.4	25.1
Cumberland River:						
Nashville, Tenn.	40.0	6	50.6	13	20.0	30.6
Tennessee River:						
Chattanooga, Tenn.	33.0	2	42.5	13	8.6	33.9
Knoxville, Tenn.	29.0	1	16.2	13	3.7	12.5
Monongahela River:						
Pittsburgh, Pa.	29.0	23	24.3	9	4.8	19.5
Savannah River:						
Augusta, Ga.	32.0	1	21.4	19, 20	8.0	13.4
Willamette River:						
Portland, Oregon ..	15.0	9	9.0	1	0.3	8.7

* Frozen.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Fort Buford, N. Dak.: an aurora was first observed at 9.55 p. m., 15th. It consisted of a well-defined arch of a light gray color of about 2° in width which rose to about altitude 25°, and extended over about 80° of the horizon, between northwest and northeast. No material changes occurred from the time it was first observed until it suddenly disappeared about 10.30 p. m. The display reappeared about 11.08 p. m., with characteristics and colors as before described, and continued so until near midnight.

Saint Vincent, Minn.: a remarkably brilliant aurora, extending from northwest to northeast, was observed from 9.45

p. m. until midnight on the 13th. It first appeared as a pale, diffused, whitish light, but soon changed to an orange color; six well-defined streamers shot up to altitude about 40° above the northern horizon. The display was perfect, and was characterized by recurring fits of brilliancy. A faint aurora was observed from 9.30 to 11.15 p. m., 22d; it was of a pale yellow color, and rose to about 15° above the horizon, and extended from azimuth 160° to 195°. During the last stage of the display it changed to a dull diffused light, which suddenly faded away. Auroral lights were also observed at this place on the 12th and 16th.

Auroras were observed during the month as follows: 3d,

Lowville, N. Y., and Webster, S. Dak. 7th, Greenwood, Wis. 12th and 13th, Saint Vincent, Minn. 15th, Sheldon, Minn.; Fort Buford, N. Dak.; Queensbury, N. Y.; Scranton, S. Dak.; Manitowoc, Wis. 16th, Saint Vincent, Minn. 17th, Riley, Ill.; Cornish, Me.; Hanover, N. H.; Leech Farm, N. Dak. 18th, South Canisteo, N. Y. 19th, Glendive, Mont.; Eagle's Mere, Pa. 22d, Saint Vincent, Minn.

THUNDER-STORMS.

The more severe thunder-storms of the month are described under "Local storms". East of the Rocky Mountains thunder-storms were reported in the greatest number of states and territories, twenty-one, on the 22d; in twenty on the 21st, 27th, and 28th; in fifteen on the 20th; in thirteen on the 18th; in from six to twelve, inclusive, on the 6th, 10th, 11th, 12th, 19th, 24th, 25th, 26th, 30th, and 31st; and in from one to five, inclusive, on the 1st, 2d, 4th, 5th, 9th, 13th, 14th, 17th, 23d, and

29th. On the 3d, 7th, 8th, 15th, and 16th no thunder-storms were reported east of the Rocky Mountains.

East of the Rocky Mountains thunder-storms were reported on the greatest number of dates, eighteen, in Texas; on thirteen dates in Alabama; on eleven dates in Arkansas and Illinois; on from five to ten dates in Florida, Georgia, Indiana, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia; and on from one to four, inclusive, in Connecticut, Indian Territory, Iowa, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, Rhode Island, South Dakota, West Virginia, and Wisconsin. In states and territories east of the Rocky Mountains other than those named, no thunder-storms were reported. The only states and territories west of the Rocky Mountains reporting thunder-storms were: California, 25th and 28th; Colorado, 30th; Utah, 23d and 29th; and Wyoming, 26th.

MISCELLANEOUS PHENOMENA.

DROUGHT.

Long and damaging drought was reported in the lower Rio Grande Valley; stock perished from need of water; the Rio Grande River was the lowest ever known at Brownsville, Tex.

HALOS.

Solar or lunar halos were reported in New England and the middle Atlantic states on twenty-three dates; 83 per cent. of the halos were attended on the first day, 65 per cent. were followed on the second day, and 61 per cent. were followed on the third day by rain or snow. In the south Atlantic states halos were reported on twelve dates; 50 per cent. of the halos were attended on the first day, 50 per cent. were followed on the second day, and 42 per cent. were followed on the third day by rain or snow. In the Gulf States halos were reported on fourteen dates; 57 per cent. of the halos were attended on the first day, 43 per cent. were followed on the second day, and 50 per cent. were followed on the third day by rain. In the Lake region halos were reported on sixteen dates; 75 per cent. of the halos were attended on the first day, 38 per cent. were followed on the second day, and 44 per cent. were followed on the third day by rain or snow. In the Mississippi and Ohio valleys halos were reported on twenty-nine dates; 73 per cent. of the halos were attended on the first day, and 63 per cent. were followed on the second and third days by rain or snow. In the Missouri Valley halos were reported on eighteen dates; 61 per cent. of the halos were attended on the first day, 67 per cent. were followed on the second day, and 55 per cent. were followed on the third day by rain or snow. In the Rocky Mountain and plateau regions halos were reported on seventeen dates; 47 per cent. of the halos were attended on the first day, 53 per cent. were followed on the second day, and 60 per cent. were followed on the third day by rain or snow. On the Pacific coast halos were reported on nineteen dates; 68 per cent. of the halos were attended on the first day, 74 per cent. were followed on the second day, and 63 per cent. were followed on the third day by rain or snow. In New England and the middle Atlantic states 48 per cent. of the halos occurred in the eastern quadrants, and 52 per cent. in the western quadrants of low pressure storms. In the south Atlantic states 58 per cent. of the halos occurred in the eastern, and 42 per cent. in the western quadrants of low pressure storms. In the Gulf States 64 per cent. of the halos occurred in the eastern, and 36 per cent. in the western quadrants of low pressure storms. In the Lake region 40 per cent. of the halos occurred in the eastern, and 60 per cent. in the western quadrants of low pressure storms. In the Mississippi and Ohio Valleys 40 per cent. of the halos occurred in the eastern, and 60 per cent. in the western quadrants of low pressure storms. In the Missouri Valley 71 per cent. of the halos occurred in the eastern,

and 29 per cent. in the western quadrants of low pressure storms. In the Rocky Mountain and plateau regions 53 per cent. of the halos occurred in the eastern, and 47 per cent. in the western quadrants of low pressure storms. On the Pacific coast 33 per cent. of the halos occurred in the eastern, and 67 per cent. in the western quadrants of low pressure storms.

Unusually well-defined and brilliant solar halos and parhelia were noted on the 2d at University and Pontotoc, Miss., Brodnax and Shreveport, La., Carrollton, Ala., Fort Smith, Ark., Peekskill, N. Y., Fulton, Wis., and Gallatin, N. Dak.; on the 4th at Fort Adams, R. I., and on the 31st at New Haven, Conn. Remarkably bright lunar halos were reported at Lawrenceburgh, Tenn., on the 2d, and at Trenton, on the 3d. The remarkable and extensively observed solar halos of the 2d occurred with high barometer, unusually low temperature, and heavy frost in the west Gulf states and the Mississippi Valley. The barometer continued high over the Gulf States during the 3d, and a low pressure storm moved southeastward over the upper lake region. On the 4th and 5th rain fell in the Gulf States, attending the presence of an area of low pressure in the Rio Grande Valley, and the development of a low pressure storm over the Gulf States.

METEORS.

Brilliant meteors were reported as follows: 3d, Nashville, Tenn.; 20th, Greensborough, Ala.; 30th, Cedar Keys, Fla. Meteors were also reported as follows: 4th, Leicester, Mass.; 6th, Butlerville, Ind.; 9th, State College, Pa.; 12th and 13th, Barren Creek Springs, Md.; 14th, Monticello, Iowa; 15th, Villa City, Fla.; Beverly, N. J.; Oregon, Mo.; 22d, Weeping Water, Nebr.; 29th, Heppner, Oregon.

MIRAGE.

Mirage were observed during the month as follows: 1st, Clinton, Mich.; 5th, Woonsocket, S. Dak.; 10th, Hampton, Iowa; 11th, Webster, S. Dak.

PRAIRIE AND FOREST FIRES.

Prairie fires were reported at Lexington, Nebr., on the 23d; at Fort Sully, S. Dak., on the 23d, 24th, 25th, and 26th; at Fort Sill, Ind. T., on the 1st to 5th, 7th, 8th, 11th to 29th; at Fort Custer, Mont., on the 22d and 23d; in Kit Carson, Colo., on the 23d and 24th; in Rooks, Lincoln, Sedgwick, and Kingman counties, Kans., on the 23d and 24th; and forest fires were reported at Egg Harbor City, N. J., on the 27th.

SUN SPOTS.

Mr. C. E. Buzzell, Leaf River, Ill.: solar observations during the month were made as follows: 4th, a good sized group of spots came into view by rotation, in high north latitude $32^{\circ} 33'$; the group was surrounded by prominent faculae, and remained unchanged until the 8th, when it

began to break up, and disappeared in faculae on the 13th. None others seen.

Mr. M. A. Veeder, Lyons, N. Y.: on March 4th a large spot, unusually far north on the sun's surface, appeared by rotation. On succeeding days it divided into several parts, and by March 13th had nearly faded out. Faculae in its location reappeared by rotation on March 31st. On March 7th faculae appeared by rotation and made the entire transit, being seen at the western limb on March 20th. On March 19th a group of faculae was about two days removed from the eastern limb. The groups of faculae of March 7th and 19th were in the location of areas that have long been much disturbed, and whose

return at the eastern limb have been attended by the chief magnetic storms of recent years, manifesting at times for months together a very exact twenty-seven day periodicity. There has been a similar reoccurrence of magnetic perturbations associated with the area occupied by the spot of March 4th continuing however since August, 1889, only.

Mr. John W. James, Riley, Ill.: a small group surrounded by very prominent faculae, on the eastern edge of the sun, 4th, very changeable in appearance, daily, and vanished 13th, before reaching the western edge. None others seen.

Mr. H. D. Gowey, North Lewisburgh, Ohio: sun spots were observed on the 9th.

VERIFICATIONS.

FORECASTS FOR 24 HOURS IN ADVANCE.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

The forecasts for districts east of the Rocky Mountains for March, 1890, were made by Captain James Allen, 3d Cavalry, Signal Officer, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps.

Percentages of forecasts verified, March, 1890.

States.		States.	
Maine.....	81.4	Kentucky.....	83.9
New Hampshire.....	83.5	Ohio.....	74.5
Vermont.....	84.2	West Virginia.....	79.7
Massachusetts.....	84.8	Indiana.....	77.4
Rhode Island.....	82.4	Illinois.....	82.8
Connecticut.....	84.1	Lower Michigan.....	82.1
Eastern New York.....	83.4	Upper Michigan.....	79.5
Western New York.....	75.2	Wisconsin.....	82.1
Eastern Pennsylvania.....	81.5	Minnesota.....	79.4
Western Pennsylvania.....	73.9	Iowa.....	78.6
New Jersey.....	84.4	Kansas.....	75.2
Delaware.....	91.5	Nebraska.....	80.5
Maryland.....	90.6	Missouri.....	82.6
District of Columbia.....	89.0	Colorado.....	71.7
Virginia.....	86.0	North Dakota.....	77.4
North Carolina.....	85.9	South Dakota.....	81.4
South Carolina.....	82.2	Southern California*.....	82.1
Georgia.....	83.7	Northern California*.....	82.8
Eastern Florida.....	78.1	Oregon*.....	75.9
Western Florida.....	86.3	Washington*.....	78.4
Alabama.....	84.8	By elements: Weather.....	82.1
Mississippi.....	81.9	Temperature.....	81.5
Louisiana.....	80.8	Monthly percentage of weather and	
Texas.....	81.1	temperature combined.....	81.9
Arkansas.....	82.3		
Tennessee.....	86.2		

* In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. † The forecasts of temperature in districts east of the Rocky Mountains for March, 1890, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. ‡ The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

FORECASTS FOR 48 AND 72 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for forty-eight and seventy-two hours, covering the second and third days in advance. Such forecasts are

optional with the predicting officer, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 195; temperature, 132. Percentages of verifications: weather, 78.5; temperature, 94.2. Weather and temperature combined, 83.3. For third day in advance. Number of predictions made: weather, 7; temperature, 34. Percentages of verifications: weather, 82.9; temperature, 86.5; weather and temperature combined, 85.6.

CAUTIONARY SIGNALS FOR MARCH, 1890.

Statement showing percentages of justifications of wind signals for the month of March, 1890:

Wind signals.—(Ordered by Captain James Allen.) Total number of signals ordered, one hundred and ten; justified as to velocity, wholly, seventy-seven, partly, eight; justified as to direction, one hundred and two. Of the signals ordered, seventy-two were cautionary signals, of which fifty were wholly, and four partly justified, and thirty-eight were storm signals, of which twenty-seven were wholly, and four partly justified. Forty-nine signals were ordered for easterly winds, of which forty-four were justified, and sixty-one were ordered for westerly winds, of which fifty-eight were justified. Percentage of justifications, 71.6.

Cold-wave signals.—(Ordered by Assistant Professor T. Russell.) Total number of signals ordered, seventy-four; justified, twenty-nine. Percentage of justifications, 39.2.

Percentages of verifications of weather and temperature signals reported by directors of the various State Weather Services for March, 1890.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois.....	81.0	78.2	New Jersey.....	84.7	92.3
Indiana.....	85.0	88.0	New York.....	84.5	87.3
Kansas.....	82.7	86.6	North and South Dakota....	82.0	84.0
Michigan.....	84.4	82.9	Ohio.....	80.0	85.0
Minnesota.....	69.0	82.0	Pennsylvania.....	82.0	88.0
Missouri.....	80.0	85.0	South Carolina.....	83.6	91.4
Nebraska.....	79.9	86.6	Tennessee.....	84.7	86.6

STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts and summaries are republished from reports for March, 1890, of the directors of the various state weather services:

ALABAMA.

Temperature.—The average temperature was 1.08 below the normal; highest monthly mean, 58.4, at Citronelle; lowest monthly mean, 47.8, at Valley Head; maximum, 84, at Citronelle, 19th, Montgomery, 21st, and at Wiggins, 20th and 26th; minimum, 10, at Valley Head, 2d; greatest local monthly range, 64, at Uniontown, Valley Head, and Wiggins; least local monthly range, 50, at Union Springs.

Precipitation.—The average was 0.66 below the normal; greatest monthly, 9.67, at Carrollton; least monthly, 2.09, at Bermuda.

Wind.—Prevailing direction, north.—P. H. Mell, Signal Corps, Auburn, director.

ARKANSAS.

Temperature.—The mean temperature was about 2 above the normal; highest monthly mean, 54.7, at Pine Bluff; lowest monthly mean, 44.9, at Wins-

low; maximum, 85, at Texarkana, 20th; minimum, 8, at Winslow, 1st; greatest local monthly range, 73, at Lead Hill; least local monthly range, 58, at Dallas, Forrest City, Ozone, and Winslow.

Precipitation.—The average precipitation was about 0.50 above the normal; greatest monthly, 10.46, at Conway; least monthly, 3.91, at Washington.—*M. F. Locke, Commissioner of Agriculture, Little Rock, director; W. U. Simons, Sergeant, Signal Corps, assistant.*

COLORADO.

Temperature.—The monthly mean was about 2 in excess of the average of the past three years; highest monthly mean, 45, at Lamar; lowest 17.4, at Climax; maximum, 83, at Lamar, 25th; minimum, —31, at Breckenridge, 12th; greatest local monthly range, 96, at Breckenridge; least local monthly range, 48, at Moraine.

Precipitation.—The average for the state was considerably in excess of the average for the last three years.

Wind.—Prevailing direction, west.—*Prof. F. H. Loud, Colorado Springs, director; W. S. Miller, Sergeant, Signal Corps, assistant.*

ILLINOIS.

Temperature.—The mean temperature was 3.5 below the normal of the last fifteen years; maximum, 72, at Flora, 21st; minimum, —26, at Belvidere, 2d.

Precipitation.—The average was 1.15 above the normal of the last thirteen years; greatest monthly, 9.21, at Golconda; least monthly, 1.57, at Sycamore.

Wind.—Prevailing direction, northwest.—*John Craig, Sergeant, Signal Corps, Springfield, in charge.*

INDIANA.

March, 1890, was cool throughout and much rain fell.

Temperature.—Highest monthly mean, 42.6, at Marengo; lowest monthly mean, 28.9, at Point Isabel; maximum, 72, at Marengo, 25th; minimum, —6, at New Providence, 6th; greatest local monthly range, 74, at New Providence; least local monthly range, 52, at Marion, Logansport, and Butlerville.

Precipitation.—The precipitation was everywhere much above the normal; greatest monthly, 16.20, at Marengo; least monthly, 1.40, at Marion.

Wind.—Prevailing direction, northwest.—*Prof. H. A. Huston, La Fayette, director; C. F. R. Wappenhans, Sergeant, Signal Corps, assistant.*

IOWA WEATHER CROP BULLETIN SERVICE.

Temperature.—Highest monthly mean, 33.4, at Glenwood; lowest monthly mean, 22.8, at Wesley; maximum, 75, at Clarinda, 24th; minimum, —24, at Fayette, 2d; greatest local monthly range, 86, at Glenwood; least local monthly range, 62, at Iowa City and Manson.

Precipitation.—Greatest monthly, 2.43, at Keokuk; least monthly, 0.32, at Grinnell.

Wind.—Prevailing direction, northwest.—*G. M. Chappel, Sergeant, Signal Corps, Des Moines, in charge, Iowa Weather Crop Bulletin Service.*

KANSAS.

Temperature.—The temperature was 3 below the normal in the eastern division, this deficiency diminished towards the west, and changed to 4 above the normal in the western division; highest monthly mean, 48.2, at Lakin; lowest monthly mean, 33.6, at Allison; maximum, 85, at Eureka Ranch and Kellogg, 17th, and at Weskan on the 25th; minimum, —5, at Tribune, 1st; greatest local monthly range, 85, at Tribune; least local monthly range, 55, at Ellsworth; greatest daily range, 48, at Dodge City, 16th; least daily range, 3, at Halstead, 30th.

Precipitation.—There was a deficiency in precipitation over the entire state; greatest monthly, 1.33, at Marmaton; least monthly, 0.00, at several stations.

Wind.—Prevailing direction, northeast.—*Prof. J. T. Lowewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

KENTUCKY.

Temperature.—The average temperature was about 3 below the normal; maximum, 78, at Canton, 21st; minimum, 3.5, at Shelbyville, 6th; greatest monthly range, 68, at Princeton; least monthly range, 48, at Mount Sterling.

Precipitation.—The precipitation was about 4.00 above the normal; greatest monthly, 10.60, at Shelbyville; least monthly, 5.40, at Millersburg. Snow storms were general throughout the state on the 1st, 5th, 30th, and 31st; the average monthly snowfall was 5.10. At nearly all stations in the northern and eastern parts of the state, a depth of from one inch to three inches was reported on the ground at the end of the month.

Wind.—Prevailing direction, southwest.—*Dr. E. A. Grant, Louisville, director; Frank Burke, Sergeant, Signal Corps, assistant.*

LOUISIANA.

The month opened with the most severe cold wave of the winter, which lasted until the 3d. The effect of the freeze on the growing crops and fruit was very disastrous.

Temperature.—The average temperature over the state was slightly below the normal; highest monthly mean, 65.1, at Bayou Sara; lowest monthly mean, 55.3, at Farmerville; maximum, 89, at Cameron, 25th; minimum, 19, at Liberty Hill, 1st; greatest local monthly range, 68, at Liberty Hill; least local monthly range, 31, at Port Eads.

Precipitation.—The average precipitation was about normal in the northern section, and about one-half inch below the normal in the southern section; greatest monthly, 9.31, at Vidalia; least monthly, 1.17, at Minden.

Wind.—Prevailing direction, southeast.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

MICHIGAN.

Temperature.—The mean temperature for the state was 2.9 below the aver-

age of fifteen years; highest monthly mean, 34.1, at Chelsea; lowest monthly mean, 14.4, at Atlantic; maximum, 60, at Adrian, 21st; minimum, —35, at Grayling, 6th; greatest local monthly range, 82, at Crystal Falls; least local monthly range, 39, at South Albion; greatest daily range, 54, at Roscommon, 8th; least daily range, 0, at Bell Branch, 24th.

Precipitation.—The average was 0.51 below the normal of fifteen years; greatest, 4.22, at Buchanan; least, 0.68, at Flint.

Wind.—Prevailing direction, northwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, director.*

MINNESOTA.

Temperature.—The temperature was nearly normal at Moorhead; it was about 2 deficient at Saint Vincent and Duluth, and it was from 5 to 6 cooler than usual in the lower half of the state; highest monthly mean, 25.9, at Mankato; lowest monthly mean, 11.8, at Saint Vincent; maximum, 55, at Mankato, 24th; minimum, —40, at Pokegama Falls, 5th; greatest local monthly range, 86, at Pokegama Falls; least local monthly range, 62, at Farmington and Rolling Green; greatest daily range, 40, at Saint Vincent, 19th; least daily range, 2, at Duluth, 27th.

Precipitation.—The precipitation was slightly in excess in the vicinity of Saint Vincent, in all other portions of the state the precipitation was deficient; greatest monthly, 2.30, at Farmington; least monthly, 0.11, at Crookston.

Wind.—Prevailing direction, northwest.—*John Healy, Corporal, Signal Corps, Saint Paul, in charge.*

MISSOURI.

Temperature.—Maximum, 76, at Oregon, Mo., and Leavenworth, Kans.; minimum, —10, at Craig.

Precipitation.—The distribution of rainfall has been nearly normal; greatest monthly, 13.00, at Oak Ridge; least monthly, 0.77, at Craig.—*Prof. Francis E. Nipher, Saint Louis, director.*

METEOROLOGICAL REPORT OF THE MISSOURI STATE BOARD OF AGRICULTURE.

Temperature.—The mean temperature was about 4 below the normal; highest monthly mean, 42.9, at Carthage, and Cairo, Ill.; lowest monthly mean, 32.2, at Conception; maximum, 78, at Ozark, 23d; minimum, —11, at Princeton, 1st; greatest local monthly range, 83, at Conception; least local monthly range, 63, at Saint Louis, and Cairo, Ill.

Precipitation.—Greatest monthly, 14.20, at Oak Ridge; least monthly, 0.77, at Craig.

Wind.—Prevailing direction, northwest.—*Levi Chubbuck, Secretary of State Board of Agriculture, Columbia, director; A. L. McRae, Sergeant, Signal Corps, assistant.*

NEBRASKA.

The month has been cold and backward, with less than the usual rainfall, but more than the usual number of rainy days.

Temperature.—The mean temperature was about 3 below the normal; maximum, 75, at Fort Sidney; minimum, —7, at Yankton, S. Dak.

Precipitation.—With the exception of a narrow strip along the northern border and a wider one along the northeastern border, the precipitation amounted to less than one inch; in the extreme northeast, and at Valentine, it amounted to over two inches.—*Prof. Goodwin D. Swezey, Crete, director; G. A. Loveland, Sergeant, Signal Corps, assistant.*

NEVADA.

The weather was very changeable, with more precipitation and lower temperature than usual.

Temperature.—The mean for the month was 0.6 below the normal; highest monthly mean, 61.6, at El Dorado Canyon; lowest monthly mean, 28.1, at Ruby Hill; maximum, 82, at El Dorado Canyon, 23d; minimum, —15, at Elko; greatest local monthly range, 77, at Elko; least local monthly range, 40, at El Dorado Canyon, Tuscarora, and Mill City.

Precipitation.—Greatest monthly, 4.39, at Lewer's Ranch; least monthly, 0.00, at Columbus Marsh.

Wind.—Prevailing direction, southwest.—*Prof. Chas. W. Friend, Carson City, director; H. E. Wilkinson, Corporal, Signal Corps, assistant.*

NEW ENGLAND METEOROLOGICAL SOCIETY.

Temperature.—The average temperature for New England was 0.1 above the normal; highest monthly mean, 39.2, at Salem; lowest monthly mean, 20.0, at West Milan; maximum, 73, at Taunton, 18th; minimum, —22, at West Milan, 4th; greatest local monthly range, 78, at West Milan; least local monthly range, 36, at Eastport; greatest daily range, 69, at West Milan, 10th; least daily range, 0, at Kendal Green, 6th.

Precipitation.—The average for New England was 2.39 above the normal; greatest monthly, 10.31, at Fall River; least monthly, 2.54, at Northfield.

Wind.—Prevailing direction, northwest.—*Prof. William H. Niles, Boston, Mass., president; Prof. Winslow Upton, Providence, R. I., secretary; J. W. Smith, Sergeant, Signal Corps, assistant.*

NEW JERSEY.

Temperature.—The mean temperature was 0.8 above the normal; highest monthly mean, 42.0, at Bridgeton; lowest monthly mean, 34.4, at Tenafly; maximum, 77, at Beverly, 12th; minimum, zero, at Tenafly, 7th; greatest local monthly range, 73, at Tenafly; least local monthly range, 51, at Ocean City; greatest daily range, 34, at Tenafly, New Brunswick, Hanover, and Egg Harbor City, 10th, 12th, 20th, and 26th, respectively; least daily range, 1, at Tenafly, Billingsport, Lambertville, Trenton, and Moorestown, 2d, 14th, 15th, and 29th, respectively.

Precipitation.—The average precipitation was 2.49 above the normal; greatest monthly, 7.92, at Tenafly; least monthly, 4.14, at Imlaystown.

Wind.—Prevailing direction, northwest.—*E. W. McGann, Sergeant, Signal Corps, New Brunswick, in charge.*

NEW YORK.

Temperature.—The mean temperature was above the normal at nearly all stations in the central lake region, and at New York City, Setauket, Canton, North Hammond, Plattsburgh, Palermo, Rochester, and Humphrey; it was generally below the normal in the regions of the Hudson and Mohawk valleys, the central plateau, and the great lake region; maximum, 74, at Fort Wadsworth, 12th; minimum, —21, at Queensbury, 7th.

Precipitation.—The rainfall was generally above the average, excepting along Lakes Erie and Ontario, and in the Saint Lawrence Valley, where deficiencies were reported; greatest monthly, 7.23, at Fort Schuyler; least monthly, 0.94, at Lyons. The greatest monthly snowfall, 28.5, was reported from Brookfield.

Wind.—Prevailing direction, northwest.—*Prof. E. A. Fuyes, Ithaca, director; I. W. Brewer, Private, Signal Corps, assistant.*

NORTH CAROLINA.

Temperature.—The monthly mean temperature was about normal; highest monthly mean, 53.6, at Southport and New Berne; lowest monthly mean, 39.6, at Highlands; maximum, 82, at New Berne, 22d; minimum, 4, at Highlands, 16th; greatest local monthly range, 64, at Willetton, Douglas, Franklin, and Highlands; least local monthly range, 46, at Hatteras.

Precipitation.—The precipitation was 2.60 below the normal, but well distributed; greatest monthly, 7.82, at Highlands; least monthly, 1.50, at Wilmington.

Wind.—Prevailing direction, southwest.—*Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Sergeant, Signal Corps, assistant.*

NORTH AND SOUTH DAKOTA.

Temperature.—The mean temperature was about normal; highest monthly mean, 33.6, at Oelrichs, S. Dak.; lowest monthly mean, 12.7, at Gallatin, N. Dak.; maximum, 69, at Oelrichs and Fort Sully, S. Dak., 23d; minimum, —36, at Sanborn, N. Dak., 3d, and at Gallatin, N. Dak., 5th; greatest local monthly range, 81, at Fort Buford, N. Dak.; least local monthly range, 63, at Yankton, S. Dak.

Precipitation.—The average was about 0.10 below the normal; greatest monthly, 2.30, at Canton, S. Dak.; least monthly, 0.03, at De Smet, S. Dak.

Wind.—Prevailing direction, northwest.—*S. W. Glenn, Sergeant, Signal Corps, Huron, S. Dak., in charge.*

OHIO.

Temperature.—The mean temperature was 1.4 below the average; maximum, 69, at Hanging Rock, 11th, and at Pomeroy, 14th; minimum, —4, at Jefferson, 7th; greatest daily range, 37, at Lewisburgh, 9th; least daily range, 3, at Cleveland, 2d, and at Columbus and Ohio State University, 31st.

Precipitation.—The mean for the state was 2.56 above the average; greatest monthly, 9.58, at Wapakoneta; least monthly 1.56, at Toledo.

Wind.—Prevailing direction, northwest.—*Prof. B. F. Thomas, Columbus, director; Lieut. Charles E. Kilbourne, secretary; C. M. Strong, Corporal, Signal Corps, assistant.*

OREGON.

Temperature.—The cool weather of the past few months continues; the mean temperature was 2.8 below the normal; highest monthly mean 48.3, at Bandon; lowest monthly mean, 35.6, at Burns; maximum, 71, at Toledo, Hubbard, and Grant's Pass, 14th; minimum, —8, at Lone Rock, 1st.

Precipitation.—The average was 0.66 above the normal; along the Columbia River from Portland to the Ocean it was about or below the normal, in other parts of the state it was generally slightly above the normal. Snow to a depth of from trace to four inches fell in western Oregon, and from trace to fifteen inches in eastern Oregon; at the close of the month there was no snow on the ground, except in the mountains and thickly wooded districts.

Wind.—Prevailing direction, southwest.—*Hon. H. E. Hayes, Master State Grange, Oswego, director; B. S. Pague, Sergeant, Signal Corps, assistant.*

PENNSYLVANIA.

Temperature.—The mean temperature was 5.5 below that of the corresponding month of 1889, and 2.5 below the normal; highest monthly mean, 38.8, at Philadelphia; lowest monthly mean, 26.3, at Eagle's Mere; maximum, 76, at Coatsville, Lancaster, Centre Valley, Annville, and Pottstown, 12th; minimum —16, at Blue Knob and Columbus, 7th; greatest local monthly range, 23.5, at Charlesville; least local monthly range, 11.9, at Rimersburgh and Eagle's Mere; greatest daily range, 59, at Charlesville, 12th; least daily range, 1, at Petersburg, 13th.

Precipitation.—The average precipitation was 2.00 above the normal; greatest monthly, 8.31, at Quakertown; least monthly, 2.90, at Altoona.

Wind.—Prevailing direction, northwest.—*Under direction of the Franklin Institute, Philadelphia; T. F. Townsend, Sergeant, Signal Corps, assistant.*

SOUTH CAROLINA.

Temperature.—The mean temperature was lower than for any other month since March, 1889; highest monthly mean, 57.2, at Hardeeville; lowest monthly mean, 45.1, at Evergreen; maximum, 85, at Hardeeville, 22d; minimum, 11, at Spartanburgh, 3d; greatest local monthly range, 65, at Spartanburgh; least local monthly range, 43, at Walhalla.

Precipitation.—Though the precipitation was less than the average, yet it was not deficient enough to do any apparent harm; greatest monthly, 5.10, at Aiken; least monthly, 1.35, at Winnsborough.

Wind.—Prevailing direction, southwest.—*Hon. A. P. Butler, Columbia, director; J. W. Cronk, Private, Signal Corps, assistant.*

TENNESSEE.

The meteorological features of March were the abnormally large rainfall, the low temperature on the 1st and 2d, the large percentage of cloudiness, and the high winds.

Temperature.—The mean temperature was a little below the normal for the past eight years; highest monthly mean, 50, at Savannah; lowest monthly mean, 41.2, at Rugby; maximum, 81, at Memphis, 27th; minimum, 10, at Trenton and Lynnville, 1st and 2d, respectively; greatest daily range, 40, at Springdale and Hohenwald, 17th and 29th, respectively; least daily range, 2, Rugby, Austin, Lewisburgh, Ashwood, and Savannah, 13th.

Precipitation.—The precipitation was nearly 3.00 in excess of the normal of the past eight years; greatest monthly, 10.29, at Clarksville; least monthly, 2.40, at Cog Hill.

Wind.—Prevailing directions, north.—*J. D. Plunket, M. D., Nashville, director; H. C. Bate, Signal Corps, assistant.*

NOTES AND EXTRACTS.

METEOROLOGICAL SUMMARY FOR HONOLULU, HAWAIIAN ISLANDS.

The following communication from Mr. Curtis J. Lyons, in charge of the weather service of the government survey, Hawaiian Islands, is of interest when considered in connection with the abnormal meteorological conditions over the greater part of the North American continent during the winter of 1889-1890:

As there has evidently been a good deal of discussion in American papers and scientific circles as to the cause or causes of the unusual weather of the past winter, I would present the fact that the weather in the Hawaiian Islands has also been different from the normal. The temperature for the month of January was 71° 35, Fahrenheit, and the normal temperature for that month is 70°. This is slight, it is true, but in no previous year since reliable averages have been obtained has it been within a degree, Fahrenheit, of this. The humidity at 9 a. m. was 79 per cent., as against probably 70 per cent. for the normal, and cloudiness, 6.6, as compared with 5. There has been hitherto an absence of the usual southwesterly storms, though this was as marked a year ago. The characteristics of the winter of 1888-1889 were as follows: An abnormal daily rise and fall of the barometer. The normal winter range, a. m. and p. m., is about .075 or .080, while during the winter referred to it was .085 or .090 some days, and even .14 was observed, the barometer rising again to the morning height at 9 p. m. Instead of the winds shifting around by the south into southwest, the direction shifted abruptly to west and northwest from northeast, sometimes as far as to southwest, and then back by the north. Long, low lines of cirro-stratus clouds prevailed in both seasons.

Mr. Lyons has also furnished the following summary of barometric record for twelve years at Honolulu, and in an accompanying communication makes the following remarks relative to barometric pressure at that place:

Observations taken from 1873 to 1877, inclusive, by Captain D. Smith; from 1883 to March, 1890, inclusive, by the Government Survey. The record represents the mean of the 9.30 a. m. and 3.30 p. m. observations, reduced to 32° Fahrenheit and sea-level.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Average.
1873...	30.06	30.07	30.09	30.08	30.05	30.05	30.05	30.06	30.00	30.03	30.04	30.01	30.051
1874...	29.93	29.88	29.97	30.02	30.04	29.96	29.95	29.95	29.91	30.00	29.91	30.00	29.968
1875...	29.96	29.91	30.02	30.02	30.04	29.97	29.98	29.95	29.94	29.97	29.95	30.00	29.974
1876...	30.00	30.09	29.86	30.11	30.20	30.13	30.17	30.08	30.03	30.05	30.01	30.06	30.066
1877...	30.02	30.06	30.05	30.12	30.09	30.13	30.13	30.11	30.10	30.09	30.11	30.08	30.092
1883...	30.063	29.937	30.034	30.107	30.105	30.063	30.083	30.086	30.071	30.054	29.988	29.926	30.043
1884...	30.041	29.957	30.079	30.032	30.075	30.098	30.061	30.064	30.130	30.027	30.061	29.902	30.044
1885...	30.023	30.022	29.998	29.999	29.986	30.079	30.010	29.994	30.046	30.047	30.117	30.089	30.032
1886...	30.003	30.045	30.101	30.126	30.147	30.148	30.073	30.089	30.052	30.071	30.078	30.083	30.085
1887...	30.053	29.966	30.054	30.053	30.047	30.028	30.049	29.998	29.978	29.964	29.937	29.959	30.008
1888...	29.905	29.996	30.069	30.063	30.012	30.056	30.046	30.000	29.997	29.991	30.020	30.069	30.019
1889...	30.092	30.065	30.121	30.103	30.098	30.064	30.030	30.047	30.018	30.057	30.038	30.064	30.068
1890...	29.994	29.986	29.983	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
*	30.014	30.001	30.037	30.067	30.074	30.066	30.051	30.036	30.031	30.029	30.022	30.021	30.038

* Average for 12 years, 1890 excepted.

The daily rise of the barometer from 5.30 to 9.30 a. m. I had already attributed, and I presume others have done the same—although I have never seen it so expressed—to the lateral pressure of air to the eastward, expanding with the heat of the approaching sun. The same appears in a marked degree in the monthly averages on the same principle, but on a different line, viz., of a least pressure in February, and a pressure rapidly increasing up to May, evidently from the approaching solar heat from the south advancing northward. From May to February the regularity of decrease is very marked. This has always seemed an interesting point or station for meteorological research, as being on the belt of trade-wind advance and retreat, so to say. The winters vary just as the trade-wind volume of the atmosphere crowds more or less to the north. I think that it enters under the westerly current of air like a wedge, i. e., the latter is low down near the sea-level say in March or April, and is lifted higher and higher as summer advances, till in July and August trades are prevalent even on the summits of Mauna Kea and Mauna Loa. In a westerly wind at only 1,500 to 2,000 feet elevation, I have looked down on trades blowing on the surface of the sea.

Meteorological record of Army post surgeons, voluntary, and other co-operating observers, March, 1890.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
<i>Alabama.</i>	0	0	0	<i>Ins.</i>	<i>Arkansas—Cont'd.</i>	0	0	0	<i>Ins.</i>
Bermuda *f.....	81	31	50.9	2.90	Harriaburgh.....	80	11	47.2	6.68
Butler.....	82	30	54.1	4.09	Heber.....	81	14	48.7	.....
Carrollton.....	77	30	52.5	9.67	Helena (1) f.....	.....	.....	.....	7.47
Citronelle.....	84	23	58.5	4.23	Hot Springs.....	.....	14	.....	9.03
Columbiana f.....	80	17	51.9	6.17	Huntington.....	80	12	47.3	8.64
Decatur (1) f.....	.....	.....	.....	3.62	Lead Hill.....	82	9	46.4	6.78
Decatur (2) f.....	.....	.....	.....	4.91	Little Rock B'ks.....	84	16	51.0	6.35
Double Springs *.....	76	14	50.8	7.11	Newport (1) f.....	.....	.....	.....	8.59
Elkmount.....	75	17	48.8	6.60	Ocala.....	78	15	48.2	6.76
Evergreen f.....	.....	.....	.....	0.92	Ocala f.....	70	12	46.0	8.91
Florence.....	74	18	49.0	.....	Pine Bluff f.....	78	18	54.7	5.10
Gadsden.....	77	18	49.3	5.75	Stuttgart f.....	82	15	51.7	9.07
Greensborough.....	79	20	53.6	5.65	Texarkana f.....	85	21	53.0	4.05
Guntersville.....	77	22	48.7	6.30	Washington f.....	84	17	54.0	3.91
Jasper.....	78	23	55.0	6.07	Winslow *f.....	66	8	44.2	5.26
Livingston (1).....	82	20	54.0	4.73	<i>California.</i>	.....	.....	.....	.....
Mount Willing.....	80	23	54.0	3.75	Alcatraz Island.....	65	40	52.3	4.93
Mt. Vernon B'ks.....	82	20	55.6	6.36	Almaden.....	76	37	54.3	3.74
Pine Apple.....	82	20	55.6	6.36	Anaheim.....	78	44	59.0	0.78
Selma (1).....	80	26	52.0	.....	Anderson.....	72	32	48.0	8.20
Tusculum (1).....	75	19	56.0	6.79	Angel Island.....	72	36	52.1	4.87
Union Springs.....	70	20	55.7	2.81	Antioch.....	65	37	52.6	2.45
Uniontown.....	83	19	55.6	6.61	Aptos.....	73	32	53.2	3.16
Valley Head f.....	74	10	46.2	6.98	Athlone.....	81	36	57.1	1.79
Wiggins.....	84	20	56.5	3.21	Auburn.....	72	34	48.7	8.08
<i>Alaska.</i>	.....	.....	.....	.....	Bakersfield.....	77	36	56.7	0.24
Juneau.....	46	10	31.4	5.89	Barstow f.....	77	29	55.2	T.
<i>Arizona.</i>	.....	.....	.....	.....	Beaumont.....	74	40	52.8	1.13
Ash Creek.....	.....	.....	.....	2.40	Belmont.....	70	37	51.2	.....
Ash Springs.....	.....	38	56.0	0.17	Benicia Barracks.....	69	35	51.8	4.01
Benson.....	83	39	59.6	0.00	Berendo.....	77	40	54.7	1.37
Bisbee.....	.....	.....	.....	0.24	Berkeley.....	68	38	50.7	4.74
Buckeye.....	.....	.....	.....	1.70	Bishop Creek.....	75	31	53.3	0.00
Casa Grande.....	93	44	66.2	0.41	Boca.....	60	10	33.4	5.45
Chiri Cahu M'f's.....	.....	.....	.....	0.00	Borden.....	79	38	56.7	1.15
Cooley's Springs f.....	.....	.....	.....	1.25	Boulder Creek.....	80	29	53.7	11.77
Dragon.....	.....	.....	.....	0.00	Brentwood.....	73	42	61.9	2.32
Das Cabezas.....	.....	.....	.....	0.08	Brighton.....	72	40	56.6	2.70
Eagle Pass.....	.....	24	45.3	0.80	Byron.....	70	38	54.9	3.16
Flagstaff.....	61	2	36.6	2.30	Caliente.....	75	32	49.2	1.10
Florence.....	89	25	60.0	0.23	Calistoga.....	72	30	50.0	0.16
Fort Apache.....	74	11	46.9	0.75	Castroville.....	71	37	53.2	1.89
Fort Bowie.....	76	21	54.8	0.00	Centerville.....	77	46	57.9	3.03
Fort Huachuca.....	.....	.....	.....	T.	Chico.....	73	36	51.5	5.65
Fort Grant.....	76	20	53.8	0.46	Ciego.....	39	21	33.2	8.70
Fort Lowell.....	89	21	58.5	0.74	Collegrove.....	.....	.....	.....	0.68
Fort McDowell.....	85	29	59.0	0.96	Colfax.....	64	32	46.8	14.70
Fort Mojave.....	85	37	58.7	0.76	Colton.....	84	38	59.1	0.50
Fort Verde.....	.....	.....	.....	1.35	Coring.....	78	30	52.9	4.56
Gila Bend.....	80	44	64.0	0.00	Crescent City.....	.....	.....	.....	13.51
Holbrook.....	81	13	47.6	0.75	Davisville.....	73	38	54.0	3.35
Lochiel.....	79	26	52.8	0.02	Delano.....	70	33	56.1	0.42
Maricopa.....	97	43	65.3	1.02	Downey.....	70	32	47.8	16.50
Mount Huachuca.....	88	26	57.8	0.03	Dunigan.....	79	47	62.9	0.77
Natural Bridge.....	.....	.....	.....	2.40	Edgewood.....	68	37	54.0	3.90
Pantano.....	83	33	56.5	0.15	El Dorado.....	60	23	41.2	5.04
Phoenix (1).....	80	29	57.4	1.18	Elmira.....	73	34	52.8	10.04
Sachse's Ranch.....	.....	.....	.....	0.10	El Verano.....	73	40	54.9	5.26
San Carlos.....	90	23	57.0	.....	Emigrant Gap.....	69	34	51.3	6.94
San Simon.....	90	33	60.0	.....	Escalante.....	43	18	34.0	13.15
Show Low.....	.....	.....	.....	4.50	Evergreen.....	70	40	53.8	3.05
Signal f.....	82	32	58.2	0.46	Farmington.....	80	35	53.8	1.78
Strawberry.....	.....	.....	.....	1.88	Felton.....	79	32	53.4	10.00
Tevison.....	.....	.....	.....	0.20	Fernando.....	83	43	60.0	0.53
Texas Hill.....	90	48	64.3	.....	Fernando.....	83	43	60.0	0.53
Tip Top f.....	.....	.....	.....	2.41	Florence.....	85	49	61.8	.....
Tucson (1) f.....	88	28	62.5	0.29	Folsom.....	75	40	54.1	6.36
Tucson (2) f.....	84	40	60.3	0.29	Fort Bidwell.....	60	6	36.4	3.97
Walnut Grove.....	.....	.....	.....	1.95	Fort Gaston.....	71	32	48.8	10.68
Walnut Ranch.....	.....	.....	.....	0.00	Fort Mason.....	65	40	52.5	4.76
Wilcox.....	84	26	59.8	0.11	Freemont.....	80	40	57.6	0.92
Yuma.....	85	50	66.3	0.00	Fruto.....	70	34	52.9	3.28
<i>Arkansas.</i>	.....	.....	.....	.....	Georgetown.....	65	29	45.5	14.70
Arkansas City f.....	.....	.....	.....	6.88	Gilroy.....	73	38	54.1	1.89
Canby.....	83	19	54.2	4.02	Girard.....	68	30	45.8	0.25
Conway.....	89	19	50.8	10.46	Glen Ellen.....	73	33	52.0	9.84
Dallas.....	79	20	53.1	4.07	Goshen.....	70	34	54.9	0.69
Dardanelle.....	.....	.....	.....	7.30	Grass Valley.....	.....	.....	.....	14.02
Forrest City f.....	80	22	54.1	8.45	Haywards.....	62	36	49.8	3.36
Fulton.....	.....	.....	.....	3.74	.....	.....	.....	.....	.....

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
<i>California—Cont'd.</i>	°	°	°	<i>Ins.</i>	<i>California—Cont'd.</i>	°	°	°	<i>Ins.</i>
Hollister.....	83	32	57.9	1.45	Traver.....	72	36	53.5	1.12
Hornbrook.....	68	28	44.8	0.70	Tropico.....	82	37	55.1	0.45
Hydenville.....	64	29	44.2	8.62	Truckee.....	46	8	30.8	7.29
Indio.....	92	40	63.8	0.00	Tulare.....	78	36	57.4	0.81
Ione.....	72	32	49.5	4.87	Turlock.....	76	38	55.9	0.71
Iowa Hill.....	69	31	45.9	14.12	Upper Mattole.....	80	32	52.6	17.83
Jolon.....	.....	41	51.2	2.50	Vacaville (1).....	72	38	52.2	5.98
Julian.....	72	35	51.0	3.63	Vacaville (2).....	74	42	53.0	5.74
Keene.....	70	32	49.4	1.98	Valley Springs.....	75	38	56.8	5.03
Kingsburgh.....	72	35	51.0	0.83	Vina.....	73	38	53.0	0.46
King City.....	82	30	50.6	1.13	Volcano Springs.....	68	39	69.1	0.00
Knight's Landings.....	68	40	57.3	3.37	Walla Walla Ck.....	60	15	32.2	4.93
La Grange.....	73	34	54.3	2.13	Walnut Creek.....	72	34	49.8	3.59
Lathrop.....	73	40	54.7	1.67	Westley.....	72	34	58.2	0.89
Laurel.....	75	37	54.1	7.40	Wheatland.....	69	30	51.0	4.45
Lemore.....	78	34	57.2	0.51	Whittier.....	83	45	51.2	0.50
Lewis Creek.....	75	30	54.8	1.40	Williams.....	58	30	50.1	3.30
Livermore.....	82	37	52.9	2.85	Willow (1) f.....	74	28	51.6	4.44
Livingston.....	78	35	53.2	0.89	Willow (2) f.....	80	30	49.9	3.85
Loomis.....	.....	.....	.....	5.88	Winters.....	75	41	56.0	4.63
Los Angeles.....	84	42	58.9	0.68	Woodland.....	70	35	50.9	3.35
Los Banos (1).....	74	38	54.9	0.75	<i>Colorado.</i>	.....	.....	.....	.....
Los Banos (2).....	75	35	54.1	0.91	Abbott.....	.....	.....	.....	0.18
Los Gatos (1).....	78	30	54.5	4.92	Agate.....	72	8	40.9	T.
Los Gatos (2).....	.....	.....	.....	5.27	Alma.....	46	-16	21.6	3.18
Mammoth Tank.....	92	50	69.1	0.00	Apishapa.....	78	2	36.5	0.85
Martinez.....	66	40	52.0	3.52	Aspen.....	52	-10	28.8	.....
Marysville.....	70	40	55.8	0.71	Beaver Creek.....	.....	.....	.....	0.46
Mendocino.....	58	32	47.3	8.15	Bennett.....	85	-7	30.2	0.05
Menlo Park.....	74	36	53.7	2.76	Brandon.....	.....	.....	.....	T.
Merced.....	75	38	56.4	1.01	Breckenridge.....	65	-31	21.2	6.45
Modesto.....	70	31	50.2	0.88	Brush.....	.....	.....	.....	0.45
Mojave.....	78	34	52.5	0.00	Byers.....	78	0	39.7	0.02
Montague.....	60	36	46.9	3.60	Canon City.....	74	4	43.6	0.45
Monterey.....	72	32	51.7	0.83	Carlisle.....	.....	.....	.....	T.
Napa.....	56	32	47.8	6.42	Castle Rock.....	71	-9	37.4	0.70
Newark.....	68	38	55.4	2.27	Cheyenne Wells.....	75	4	34.7	.....
Newhall.....	82	34	53.8	0.44	Climax.....	38	-17	17.4	6.10
Newman.....	70	40	53.6	0.80	Crook.....	.....	.....	.....	0.01
Niles.....	71	36	54.3	3.00	Deer Trail.....	72	-6	33.9	T.
Norwalk.....	83	45	58.9	0.45	Delta f.....	67	5	40.4	0.83
Oakland (1).....	75	37	54.3	3.52	Denver.....	69	-4	40.7	0.29
Oakland (2).....	66	40	53.0	3.65	Durango (1).....	.....	.....	.....	1.80
Ontario.....	81	40	62.2	1.25	Durango (2).....	70	1	40.8	1.68
Orland.....	74	38	55.0	3.59	Eagle Farm.....	.....	.....	.....	0.55
Oroville.....	75	38	53.7	7.07	Elkhorn.....	.....	.....	.....	0.91
Pajaro.....	75	35	53.2	2.13	First View.....	75	8	41.8	T.
Pasadena.....	77	35	55.8	0.72	Fort Collins.....	70	-9	38.0	0.22
Paso Robles.....	76	29	50.5	1.74	Fort Crawford.....	51	0	34.8	1.17
Petaluma.....	69	36	53.3	4.94	Fort Lewis.....	55	-13	33.3	1.75
Placerville.....	70	34	49.1	13.16	Fort Logan.....	72	5	40.2	0.10
Pomona.....	71	38	51.7	.....	Fort Morgan.....	.....	.....	.....	T.
Porterville.....	87	37	58.4	1.30	Fraser f.....	.....	-27	19.4	3.68
Presidio of S. F.....	72	35	51.4	5.28	Fruits.....	71	-6	40.6	0.62
Puente.....	77	30	55.5	0.78	Georgetown.....	52	1	32.6	0.86
Red Bluff.....	75	37	54.7	6.37	Greeley.....	65	-4	34.4	0.36
Redding.....	75	38	53.9	7.77	Gunnison.....	59	-7	29.8	0.26
Riverside.....	83	32	52.5	0.55	Hardin.....	59	.....	.....	0.05
Rocklin.....	75	37	53.9	4.54	Hugo.....	70	0	42.6	.....
Rumsey.....	75	37	53.1	5.32	Husted.....	71	-7	39.1	0.57
Sacramento (1).....	72	30	49.3	3.73	Kirk.....	.....	.....	.....	0.35
Sacramento (2).....	69	40	53.5	2.49	Rit Carson.....	71	20	43.5	.....
Salinas (1).....	75	36	51.0	1.79	Laird.....	.....	.....	.....	0.11
Salinas (2).....	67	38	51.7	1.80	Lamar.....	83	1	45.0	0.05
Salton.....	90	39	65.4	.....	Las Animas.....	79	1	42.8	.....
Sanger Junction.....	79	35	57.3	1.22	Lay.....	.....	.....	.....	1.38
San Ardo.....	78	34	53.3	0.99	Leadville.....	45	-11	21.8	1.34
San Diego B'ks.....	77	41	56.4	0.40	Le Roy.....	.....	.....	39.9	0.04
San Gabriel.....	82	41	58.2	0.69	Magnolia.....	70	7	33.2	.....
San Jose.....	72	37	53.9	2.08	Middle Box Elder.....	.....	.....	.....	0.40
San Mateo.....	62	38	49.1	3.94	Monte Vista.....	64	-8	33.4	0.56
San Miguel.....	77	36	53.8	0.81	Montezuma Valley.....	70	30	45.0	1.70
San Pedro.....	74	46	57.8	0.72	Moraine.....	53	5	31.2	0.71
Santa Ana.....	80	40	57.2	3.22	Palmer Lake.....	66	-2	36.0	0.90
Santa Barbara (1).....	78	38	55.6	1.10	Parachute.....	.....	.....	.....	0.93
Santa Barbara (2).....	78	46	57.4	0.95	Peyton.....	.....	.....	.....	0.30
Santa Clara.....	72	35	.....	1.99	Ranch near Como.....	49	-7	24.3	1.02
Santa Cruz.....	70	38	54.5	5.58	Red Cliff.....	.....	.....	.....	3.11
Santa Margarita.....	69	30	51.7	3.49	River Bend.....	88	21	54.9	.....
Santa Maria.....	76	34	54.7	0.88	Rocky Ford.....	80	30	38.9	0.15
Santa Monica.....	72	42	60.3	0.94	Sarborn.....	.....	.....	.....	0.56
Santa Paula.....	76	49	61.2	0.47	San Luis Ex. Sta.....	64	5	36.4	0.02
Santa Rosa.....	68	34	49.6	6.15	Sedgwick.....	.....	.....	.....	0.05
Selma.....	74	38	54.6	1.19	Sheridan Lake.....	.....	.....	.....	T.
Seven Palms.....	90	47	68.4	.....	Sunnyside.....	.....	.....	.....	0.15
Shingle Springs.....	69	32	51.3	10.48	T. S. Ranch.....	68	-3	39.3	1.27
Sims.....	68	25	42.8	19.83	Thon.....	72	-2	37.4	0.18
Sisson.....	55	17	36.8	5.30	Upper Pine.....	72	.....	.....	2.74
Soledad.....	78	32	52.2	0.37	Vilas.....	59	.....	.....	0.14
Sonoma.....	71	38	52.4	6.16	Watkins.....	72	2	40.6	0.02
Soquel.....	78	34	57.0	.....	Watervale.....	.....	.....	.....	0.88
South Side.....	78	34	53.2	0.40	Westcliffe.....	59	-14	34.2	0.39
South Vallejo.....	69	35	50.1	3.73	Wray.....	.....	.....	.....	T.
Spadra.....	84	38	45.9	0.75	Wigwam.....	.....	.....	.....	0.30
Steeles.....	75	38	54.2	2.96	Yuma.....	.....	.....	.....	0.10
Stockton (1).....	.....	.....	.....	1.26	<i>Connecticut.</i>	.....	.....	.....	.....
Stockton (2).....	63	32	51.6	1.76	Birmingham.....	.....	.....	.....	6.55
Summit.....	38	27	33.6	14.00	Canton.....	66	-4	32.3	5.80
Suisun City.....	74	40	53.5	5.46	Colechester.....	67	2	32.3	.....
Susannahville.....	58	12	36.2	4.60	Falls Village.....	.....	.....	.....	5.86
Tehachapi.....	63	25	44.5	0.30	Fort Turnbull.....	66	6	36.2	6.55
Tehama.....	65	50	56.5	3.79	Hartford (1).....	69	1	33.4	7.03
Templeton.....	76	33	53.6	2.07	Hartford (2).....	.....	.....	.....	7.26
Towles.....	60	28	41.9	3.00	Lake Konomoc.....	.....	.....	.....	9.53
Tracy.....	69	30	49.6	1.96	Lebanon.....	.....	.....	.....	6.45

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Connecticut—Cont'd.</i>	o	o	o	Ins.	<i>Illinois—Cont'd.</i>	o	o	o	Ins.
Mansfield.....	66	-7	30.8	6.12	Rushville.....	66	-2	32.3	2.49
Meridian.....	66	-2	27.0	7.45	South Evanston.....	55	-2	29.6	2.96
Middletown.....	66	0	32.7	7.45	Sycamore.....	57	-11	27.1	1.57
New Britain.....	66	0	32.7	7.45	Warsaw.....	57	0	31.9	0.17
New Hartford (1).....	55	-9	22.2	5.97	Watseka.....	62	2	32.3	3.28
New Hartford (2).....	66	5	31.9	7.22	White Hall.....	68	2	37.5	2.12
Shelton.....	66	5	31.9	7.22	Winnebago.....	58	-15	28.4	1.64
Southampton.....	67	1	32.2	7.18	<i>Indiana.</i>				
South Manchester.....	67	1	32.2	7.18	Angola.....	56	-2	32.1	3.16
Unenaville.....	67	1	32.2	7.18	Butterfield.....	56	-2	32.1	3.16
Voluntown.....	60f	1f	35.4	7.81	Cannelton.....	66	6	39.1	10.99
Wallingford.....	60f	1f	35.4	7.81	Columbia City.....	57	0	31.9	3.47
Waterbury.....	65	0	31.6	6.08	Columbus.....	67	2	38.3	5.70
West Simsbury.....	65	0	31.6	6.08	Connersville.....	63	4	33.5	4.74
<i>Delaware.</i>				5.39	De Gonia Springs.....	63	5	40.4	10.74
Kirkwood.....	10	36.2			Delphi.....	59	3	31.6	3.12
<i>District of Columbia.</i>					Evansville.....	62	6	35.8	3.96
Kendall Green.....	73	14	40.9	3.64	Farmland.....	62	6	35.8	3.96
Washington B'ks.....	73	15	41.7	3.64	Franklin.....	67	5	36.1	4.05
<i>Florida.</i>					Huntingburg.....	66	11	40.5	10.87
Altamonte Springs.....	90	29	66.0	1.45	Huntington.....	67	2	40.0	9.94
Alva.....	93	29	65.1	1.17	Jeffersonville.....	67	2	40.0	9.94
Archer.....	88	23	61.7	3.25	Laconia.....	70	2	39.1	8.55
Fort Barrancas.....	82	25	59.8	4.11	La Fayette.....	63	4	34.0	3.11
Fort Meade.....	87	22	59.7	4.90	Logansport (1).....	56	4	31.7	3.50
Homeland.....	91	25	65.5	1.20	Logansport (2).....	56	4	31.7	3.50
Hypoluxo.....	37	68.0	1.49		Marengo.....	72	0	42.6	16.70
Lake City.....	88	23	61.5	3.54	Marion.....	59	7	29.0	1.40
Madison.....	80	28	60.8	3.39	Mauzy.....	62	-1	32.5	4.86
Manatee.....	90	26	64.4	2.17	Mount Vernon (1).....	65	7	39.6	10.19
Matanzas.....	86	31	62.1	1.64	Mount Vernon (2).....	65	7	39.6	10.19
Merritt's Island.....	88	34	62.9	1.03	Muncie.....	74	10	37.4	3.07
Pine Level.....	36	66.0	3.41		New Providence.....	68	-6	34.0	11.17
San Antonio.....	89	38	62.1	1.33	Point Isabel.....	70	1	37.0	5.64
St. Francis B'ks.....	87	28	62.6	3.11	Princeton.....	66	7	39.0	8.75
Tallahassee.....	82	23	57.5	4.66	Richmond.....	62	4	33.7	4.35
Villa City.....	88	35	63.5	1.62	Rockville.....	62	7	35.7	3.31
<i>Georgia.</i>					Rushville.....	67	4	38.5	6.40
Andersonville.....	99f	34f	72.2f	7.68	Seymour.....	67	4	38.5	6.40
Athens (1).....	77	19	50.4	4.32	Shelbyville.....	62	9	37.2	4.24
Athens (2).....	81	18	52.3	3.61	Spiceland.....	63	4	35.6	4.26
Diamond.....	15	45.6	5.85		Sunman.....	66	2	35.0	5.20
Forsyth.....	84	22	55.4	2.66	Vevay.....	68	2	39.4	7.84
Fort McPherson.....	78	10	37.4	2.87	Vincennes.....	68	2	39.4	7.84
Gillsville.....	75	24	52.3	4.15	Worthington.....	64	5	35.3	5.36
Hephzibah.....	80	26	58.0	1.18	<i>Indian Territory.</i>				
Jesup.....	82	22	55.8	2.91	Caddo Creek.....	86	20	54.7	
Louisville.....	82	22	55.8	2.91	Eufaula.....	80k	7k	52.0k	4.42
Marietta.....	76	16	47.9	4.45	Fort Gibson.....	84	14	50.5	0.31
Milledgeville.....	82	21	53.7	2.48	Fort Reno.....	84	14	50.5	0.31
Millen.....	87	21	54.3	3.55	Fort Sill.....	83	13	48.2	0.31
Monticello.....	22	50.5	3.90		Fort Supply.....	80	18	50.5	0.62
Point Peter.....	21	49.2	3.75		Guthrie.....	80	18	50.5	0.62
Perry.....	22	53.8	2.31		Healdton.....	79	16	52.2	2.36
Quitman (1).....	81	24	57.9	1.85	Tulsa.....	80	18	50.5	0.62
Woolley's Ford.....	74	18	46.4		<i>Iowa.</i>				
<i>Idaho.</i>					Amana.....	62	-14	28.8	1.39
Boise Barracks.....	65	13	41.3	3.56	Ames.....	66	-14	28.0	1.20
Era.....	54	-10	28.4	1.14	Bancroft.....	57	-19	23.2	1.95
Fort Sherman.....	53	8	36.4	2.63	Belle Plaine.....	63	-12	27.5	1.15
Kootenai.....	53	7	34.9	1.15	Blakeville.....	64	-14	26.7	1.49
Lewiston.....	65	31	44.0	1.90	Carroll.....	67	-12	26.7	1.98
Soda Springs.....	47	-16	24.5	1.06	Cedar Rapids.....	62	-10	29.1	2.08
<i>Illinois.</i>					Clarinda.....	75	8	31.2	1.95
Aurora (1).....	58	-10	28.4	2.64	Clinton.....	61	-19	28.8	2.97
Aurora (2).....	58	-6	29.3	3.13	Cresco.....	55	-18	22.6	1.06
Beardstown.....	60	2	32.2	1.45	Des Moines.....	67	-9	30.0	
Beason.....	55	-26	26.5	1.88	Eagle Grove.....	57	-22	34.6	1.10
Centerville.....	60	2	32.2	1.45	Elkader.....	56	-24	27.2	0.86
Charleston.....	63	5	35.2	3.37	Fayette.....	57	-24	24.5	1.21
Cockrell.....	58	-21	29.0		Fort Madison.....	58	-5	32.2	3.67
Collinsville.....	65	6	37.6	4.69	Glenwood (1).....	74	-12	32.8	0.32
Dwight.....	63	-1	32.0	3.37	Glenwood (2).....	64	-9	25.2	0.68
East Peoria.....	66	2	35.8	3.13	Hampden.....	62	-14	22.7	1.55
Fort Sheridan.....	72	0	38.0	7.41	Humboldt.....	64	-20	25.2	1.18
Gibson City.....	56	-2	29.6	2.33	Independence.....	64	-20	25.2	1.18
Goconda.....	62	2	31.2	2.80	Iowa City.....	56	-6	30.3	1.80
Grand Tower.....	70	11	41.5	9.21	Larrabee.....	57	-21	24.3	1.56
Greenville.....	69	5	36.7	5.42	Le Claire.....	67	-13	31.6	1.76
Griggsville.....	65	0	35.1	2.75	Logan.....	67	-13	31.6	1.76
Hennepin.....	49	-7	24.5	4.59	Manson.....	54	-8	24.8	1.15
Irishtown.....	68	2	38.0	7.33	Maquoketa.....	62	-15	29.8	1.90
Jordan's Grove.....	68	2	38.0	7.33	McCausland.....	61	-10	31.3	1.77
Lacon.....	64	3	32.5	4.18	Monticello.....	59	-16	27.8	1.86
Lake Forest.....	54	-5	26.7	3.29	Mount Pleasant.....	62	-5	28.4	2.03
Lanark.....	54	-5	26.7	3.29	Mount Vernon.....	63	-13	28.4	
Louisville.....	54	-5	26.7	3.29	Oskaloosa (1).....	66	-10	30.4	0.89
Martinsville.....	65	8	37.9	6.45	Sac City.....	51	-10	23.4	1.13
Mascoutah.....	70	2	37.5	4.62	Storm Lake.....	54	-12	23.7	1.94
McLeansborough.....	70	4	37.5	4.62	Vinton.....	61	-11	26.9	1.38
Mount Carmel.....	70	4	37.5	4.62	Washington.....	62	-8	31.8	1.84
Olney.....	70	9	39.2	6.52	Webster.....	67	-17	25.2	1.08
Oswego.....	58	-10	28.2	2.89	West Bend.....	58	-20	23.6	1.65
Ottawa.....	64	-1	32.9	3.33	<i>Kansas.</i>				
Palestine.....	65	6	37.8	5.05	Abilene.....	72	15	38.4	
Pana.....	66	2	38.4	2.88	Allison.....	82	0	33.6	0.05
Peoria (1).....	65	-1	35.1	2.73	Arlington.....	82	0	33.6	0.05
Peoria (2).....	65	-1	35.1	2.73	Bendena.....	82	0	33.6	0.05
Phil.....	63	3	34.5	3.58	Bunker Hill.....	80	0	41.6	0.00
Pontiac.....	62	-3	32.8	3.58	Burr Oak.....	70	8	37.4	
Riley.....	53	-13	25.6	2.14	Calro.....	72	20	52.9	0.50
Rockford.....	54	-18	26.3	2.42	Carneiro.....	80	10	42.0	
Rock Island Arl.....	62	-11	29.9	3.20	Collyer.....	72	15	43.8	0.05

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Kansas—Cont'd.</i>	o	o	o	Ins.	<i>Louisiana—Cont'd.</i>	o	o	o	Ins.
Concordia.....	70	12	37.3	0.05	Grand Coteau.....	81	26	61.2	3.40
Conway.....	70	12	38.4	0.10	Hammond.....	84	22	59.8	4.20
Cunningham.....	79	7	40.9	0.04	Houma.....	85	25	61.7	1.51
Downs.....	78	10	39.3	0.45	Jackson Barracks.....	83	25	62.8	2.03
Elco.....	78	10	39.3	0.45	Jenette.....	83	23	62.1	2.60
Elk Falls.....	75	9	39.9	0.00	Jonesville.....	83	23	62.1	2.60
Ellis (1).....	75	9	39.9	0.00	La Fayette.....	82	26	61.7	2.05
Emporia.....	72	10	40.4	0.00	Lake Charles.....	81	26	57.4	6.05
Englewood.....	83	18	45.9	0.02	Liberty Hill.....	87	19	56.0	5.63
Eureka Ranch.....	85	7	41.7	0.05	Luling.....	82	23	57.8	2.53
Ft. Leavenworth (1).....	70	-3	37.9	0.58	Mandeville.....	84	22	60.2	2.87
Ft. Leavenworth (2).....	72	-3	35.4	0.70	Marksville.....	85	20	59.6	7.12
Fort Riley.....	76	-3	38.7	0.04	Maurepas.....	83	22	61.8	3.30
Fremont.....	79	8	40.7	0.05	Melville.....	83	25	60.1	5.45
Gibson.....	70	5	39.6	0.00	Minden.....	85	20	57.1	1.17
Globe.....	74	8	34.8	0.51	Monroe.....	82	20	56.6	6.61
Gove City.....	81	11	41.2	0.12	New Iberia.....	84	25	62.0	3.65
Greenridge.....	76	11	38.5	0.00	Paincourtville.....	83	23	61.2	3.15
Grenola.....	82	6	43.6	0.70	Plaquemine.....	83	22	58.5	5.28
Haltstead.....	76	12	42.0	0.06	Port Eads.....	70	45	65.1	4.49
Havensville.....	74	-4	34.1	0.30	Shell Beach.....	81	24	59.2	2.00
Horton.....	75	0	37.8	0.07	Sugar Ex. Station.....	80	27	60.6	1.98
Hoxie.....	80	2	42.1	0.00	Thibodaux.....	80	25	58.4	9.31
Independence.....	79	9	43.0	0.85	<i>Maine.</i>				
Kansas City.....	70	1	37.4	0.80	Bar Harbor.....	46	6	31.4	6.31
Kellogg.....	85	5	46.8	0.72	Belfast.....	46	6	30.4	
Kirwin.....	19	39.5	0.95		Calais.....	54	5	29.6	6.19
La Harpe.....	81	12	48.2	0.00	Cornish.....	55	0	28.6	5.65
Lakin.....	19	39.5	0.95		Fairfield.....	50	-16	28.0	4.61
Larned.....	76	4	37.8	1.02	Farmington.....	50	0	26.2	4.08
Lawrence.....	76	4	37.8	1.02	Fort Preble.....	50	0	26.2	4.08
Lebo.....	78	5	40.2	0.51	Gardiner.....	49	-5	29.5	4.52
Leoti.....	80	5	41.2	0.00	Kennebec Arsenal.....	50	6	30.1	4

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Massachusetts—Con.</i>	0	0	0	<i>Ins.</i>	<i>Michigan—Cont'd.</i>	0	0	0	<i>Ins.</i>
Plymouth.....	66	7	35.8	10.14	Pontiac.....	52	4	29.4	1.94
Princeton.....	58	5	29.2	.....	Pulaski.....	50	0	28.1	2.24
Provincetown.....	60	13	35.1	6.96	Rawsonville.....	50	3	30.5	2.80
Randolph.....	60	.....	.....	5.64	Romeo.....	54	1	30.1	1.61
Roberts' Dam.....	.....	.....	.....	7.43	Rosecommon.....	45	32	20.8	2.20
Royalston.....	60	0	34.0	.....	Saint Ignace.....	45	23	19.8	2.11
Salem (1).....	61	3	39.2	.....	Saint John's.....	55	3	25.2	2.07
Salem (2).....	.....	.....	.....	6.97	Sand Beach.....	50	3	24.8	0.73
Somerset.....	70	0	35.2	9.61	South Albion.....	50	11	32.8	3.13
South Hingham.....	.....	.....	.....	8.00	Stanton.....	48	10	27.0	2.13
Springfield Arm'y.....	65	2	32.1	6.36	Stockbridge.....	52	.....	.....	1.21
Taunton (1).....	70	2	35.1	7.73	Thornville.....	52	2	28.3	2.94
Taunton (2).....	73	2	34.7	8.77	Vandalia.....	53	2	29.2	1.53
Taunton (3).....	73	4	33.8	8.40	Vienna.....	.....	.....	.....	2.27
Wakefield.....	50	2	30.8	7.49	Washington.....	52	0	28.8	1.98
Waltham.....	.....	.....	.....	7.04	Weldon Creek.....	46	17	24.7	3.39
Wellfleet.....	65	4	33.5	8.20	West Branch.....	46	13	23.1	1.85
Westborough.....	66	0	34.3	6.82	Williamstown.....	50	0	31.0	1.90
Williamstown.....	58	10	28.3	4.06	Ypsilanti (1).....	52	1	28.1	1.57
Winchester.....	.....	.....	.....	5.66	Ypsilanti (2).....	58	5	31.6	1.30
Worcester (1).....	62	0	31.2	5.47	<i>Minnesota.</i>	.....	.....	.....	0.85
Worcester (2).....	64	2	32.4	.....	Alexandria.....	45	25	17.1	0.11
<i>Mexico.</i>	.....	.....	.....	.....	Crookston.....	45	14	23.4	2.30
La Logia.....	90	47	66.0	0.05	Farmington.....	48	.....	.....	0.29
Leon de Aldemas.....	84	36	63.1	0.24	Fergus Falls.....	48	.....	.....	0.77
Pueblo.....	77	40	61.5	0.01	Fort Ripley.....	50	20	22.3	2.90
<i>Michigan.</i>	.....	.....	.....	.....	Grand Meadow.....	44	21	18.5	0.34
Adrian.....	60	2	31.0	1.65	L. Winnibegoshish.....	48	25	15.9	0.42
Albion (1).....	54	2	30.2	3.49	Leech Lake.....	46	34	15.3	0.63
Albion (2).....	.....	.....	.....	2.42	Le Sueur.....	52	18	23.1	0.62
Alma.....	52	11	27.0	2.18	Mankato.....	53	14	25.9	0.93
Amadore.....	50	0	27.1	1.70	Medford.....	50	28	20.9	0.75
Ann Arbor.....	53	0	29.2	1.69	Minneapolis.....	50	15	22.2	1.68
Arbela.....	.....	.....	.....	1.71	Montevideo.....	54	17	22.7	0.79
Atlantic.....	34	10	14.4	1.50	Morris.....	49	20	20.9	1.11
Ball Mountain.....	58	7	27.6	1.07	Northfield.....	47	23	22.8	0.68
Bangor.....	57	7	30.1	2.93	Ortonville.....	49	.....	.....	0.70
Bear Lake.....	47	22	23.2	2.95	Owatonna.....	52	19	21.9	0.63
Bell Branch.....	59	5	29.7	0.98	Pine River.....	45	36	16.7	0.21
Benton Harbor.....	59	4	33.0	2.77	Pokegama Falls.....	46	40	15.6	0.98
Bensonia.....	45	4	24.2	3.61	Red Wing.....	46	17	23.8	0.46
Berlin.....	45	5	27.9	2.45	Redwood Falls.....	.....	.....	.....	1.62
Berrien Springs.....	48	15	25.0	2.42	Rolling Green.....	48	14	21.3	0.50
Big Rapids.....	35	3	30.2	1.48	Saint Charles.....	50	20	20.4	0.57
Birmingham.....	55	0	26.4	1.95	Sheldon.....	50	20	22.4	0.27
Bronson.....	50	0	29.4	4.22	<i>Mississippi.</i>	.....	.....	.....	7.97
Buchanan.....	54	8	19.4	0.95	Agricultural Col'ge.....	80	19	52.3	7.97
Calumet.....	49	3	30.7	2.81	Batesville.....	80	19	51.7	7.15
Cassopolis.....	55	21	22.2	2.90	Booneville.....	86	14	52.5	7.10
Caldwell.....	46	26	22.0	0.89	Brookhaven.....	85	21	57.7	9.85
Charlevoix.....	48	24	22.7	.....	Canton.....	82	23	52.9	6.33
Chase.....	58	0	34.1	2.13	Columbus (1).....	84	18	52.9	6.02
Chelsea.....	57	2	30.4	2.39	Columbus (2).....	83	21	56.8	5.66
Clinton.....	50	0	26.5	2.63	Edwards.....	84	23	56.7	7.63
Colon.....	50	0	28.4	.....	Fayette.....	84	23	57.8	6.63
Columbiaville.....	54	1	28.6	2.12	Greenville.....	77	21	57.7	7.50
Concord.....	56	26	19.9	1.63	Holly Springs (1).....	73	18	48.2	5.80
Crystal Falls.....	57	10	26.8	2.45	Kosciusko.....	81	20	54.2	6.65
East Tawas.....	57	5	28.5	1.98	Lake.....	85	16	54.6	8.35
Eden.....	54	5	28.5	1.98	Lamar.....	76	17	49.2	2.24
Evart.....	47	27	21.6	2.27	Logtown.....	81	24	61.0	8.43
Fairview.....	.....	.....	.....	1.08	Louisville.....	84	15	53.5	9.10
Fitchburg.....	52	4	27.7	0.68	Macon (1).....	81	36	67.2	9.10
Flint.....	30	34	17.8	1.69	Macon (2).....	81	35	60.0	4.10
Fort Brady.....	43	14	30.0	0.34	Natches.....	82	25	57.6	3.80
Fort Mackinac.....	58	3	30.8	1.42	Oakland.....	81	20	58.2	8.93
Fort Wayne.....	48	13	25.0	1.32	Palo Alto.....	81	30	58.2	2.30
Frederick.....	37	31	17.1	.....	Perth Amboy.....	80	30	58.8	5.60
Gaylord.....	46	17	22.1	0.85	Port Gibson.....	84	20	50.7	8.06
Gladwin.....	37	10	26.4	1.21	Pontotoc.....	82	18	51.3	8.12
Grand Rapids.....	56	0	30.8	1.07	Rensselaer.....	77	18	51.3	9.59
Grape.....	44	35	18.1	1.80	Summit.....	81	24	56.1	8.86
Grayling.....	46	20	20.8	2.78	Vaiden.....	85	19	51.4	8.09
Gulliver Lake.....	54	1	31.4	1.73	Washington.....	84	23	58.4	8.60
Hanover.....	50	14	23.1	0.99	Water Valley.....	81	19	53.2	4.14
Harrison.....	49	14	23.1	1.89	Waynesboro' (1).....	82	30	59.2	7.09
Harrisville.....	50	15	27.0	2.45	West Point.....	77	20	54.0	5.15
Hartford.....	56	0	31.0	1.57	Yasoo City.....	.....	.....	.....	.....
Hastings.....	52	2	28.6	2.73	<i>Missouri.</i>	.....	.....	.....	.....
Hayes.....	53	7	28.3	0.98	Appleton City.....	74	5	39.9	2.20
Highland Station.....	50	1	27.7	0.90	Brunswick.....	70	3	30.7	2.20
Hillman.....	44	31	20.1	1.30	Carthage.....	73	9	43.0	1.08
Hilledale.....	53	0	30.6	1.82	Conception.....	71	3	33.4	0.82
Howell.....	.....	.....	.....	1.07	Craig.....	70	10	33.7	0.77
Hudson.....	59	3	29.6	1.37	Excelsior Springs.....	69	4	32.4	2.73
Iron.....	47	5	26.8	3.45	Fayette.....	66	2	36.4	5.70
Ivan.....	44	19	22.7	2.03	Fox Creek.....	66	49	32.49	3.30
Jeddo.....	50	0	26.9	0.81	Frankford (1).....	68	3	36.1	1.77
Kalamazoo.....	54	0	30.2	1.96	Glasgow.....	70	4	33.0	1.66
Lansing.....	56	4	28.5	1.31	Grand Pass.....	71	4	33.0	4.44
Lathrop.....	41	26	18.5	1.75	Harrisonville.....	74	4	42.5	8.45
Madison.....	58	1	28.5	1.72	Ironport.....	70	1	39.4	4.51
Marshall.....	55	2	28.9	2.24	Jefferson Barracks.....	70	1	39.4	2.12
May.....	51	6	26.5	1.49	Jerome.....	74	4	38.2	1.50
Mio.....	42	21	21.8	1.92	Kansas City.....	74	4	38.2	2.00
Montague.....	45	11	25.4	2.22	Kirkville.....	72	8	43.2	.....
Mottville.....	59	3	30.4	2.39	Lebanon.....	72	1	30.4	.....
Noble.....	.....	.....	.....	3.56	Liberty.....	72	1	30.4	.....
North Marshall.....	52	4	27.3	0.90	Louisiana Bridge.....	74	4	35.4	0.30
Oliver.....	52	5	27.4	1.70	Mexico.....	74	4	35.4	0.30
Otsego.....	59	4	28.8	2.51	Miami.....	74	4	37.6	6.30
Ovid.....	50	5	27.7	1.44	New Haven.....	74	7	41.0	.....
Parkville.....	59	10	28.7	2.62	Oak Ridge.....	77	7	41.0	.....
Paw Paw.....	59	10	28.7	2.30	.....	.....	.....	.....	.....

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Missouri—Cont'd.</i>	0	0	0	<i>Ins.</i>	<i>Nevada—Cont'd.</i>	0	0	0	<i>Ins.</i>
Oregon.....	74	2	34.3	1.32	Ruby Hill.....	51	0	26.1	3.70
Ozark.....	78	0	41.6	3.70	Sodaville.....	70	21	45.0	0.02
Princeton.....	72	11	33.6	1.69	Tecoma.....	60	0	36.4	.....
Saint Charles (1).....	70	4	37.7	3.70	Tusacora.....	50	10	30.6	3.75
Saint Charles (2).....	70	4	37.7	4.17	Verdi.....	60	15	37.4	2.00
Saint Joseph.....	73	2	37.7	0.85	Virginia City.....	58	15	38.6	0.70
Sedalia.....	73	2	37.7	1.74	Younts Ranch.....	76	26	53.6	0.20
Shelbina.....	71	2	39.1	4.50	<i>Newfoundland.</i>	.....	.....	.....	.....
Steelville.....	71	2	39.1	7.89	Saint John's.....	55	9	31.9	5.30
Thayer.....	.....	.....	.....	5.30	<i>New Hampshire.</i>	.....	.....	.....	.....
Troy.....	70	3	36.2	2.03	Antrim.....	.....	.....	.....	5.01
Warrensburg.....	70	3	36.2	2.03	Belmont.....	.....	.....	.....	5.64
Warrenton.....	79	4	43.5	6.92	Berlin Falls.....	54	19	23.0	.....
Willow Springs.....	79	4	43.5	6.92	Berlin Mills.....	48	14	25.7	3.48
Wither's Mill.....	68	0	31.7	3.17	Concord.....	61	7	30.2	5.07
Centerville.....	.....	.....	.....	8.20	East Canterbury.....	58	5	28.4	5.03
<i>Montana.</i>	.....	.....	.....	.....	Hanover (1).....	50	11	27.8	3.24
Blackfoot Agency.....	56	4	31.8	0.52	Hanover (2).....	53	14	27.9	3.41
Camp Poplar River.....	52	22	22.2	0.34	Lake Village.....	.....	.....	.....	5.21
Custer.....	52	7	27.7	0.11	Manchester (1).....	59	4	32.1	6.03
Fort Assiniboine.....	55	4	35.4	1.18	Mine Falls.....	62	4	31.1	7.11
Fort Custer.....	66	1	30.6	0.69	Nashua.....	60	2	31.0	5.61
Fort Keogh.....	58	10	30.8	0.40	North Conway.....	51	6	28.6	2.76
Fort Logan.....	52	7	31.8	1.80	North Sutton.....	.....	.....	.....	3.71
Fort Maginnis.....	54	12	34.0	1.13	Pennichuck Station.....	.....	.....	.....	6.48
Fort Missoula.....	67	12	35.9	0.48	Plymouth.....	49	8	27.0	4.41
Fort Shaw.....	69	15	29.4	0.04	Stratford.....	46	20	29.8	3.66
Glendive.....	69	15	29.4	0.04	Walpole.....	52	11	26.1	4.68
Kintyre.....	53	8	31.0	1.77	West Milan.....	56	22	20.0	3.90
Martinsdale.....	60	20	33.4	1.09	Wier's Bridge.....	.....	.....	.....	4.90
Powder River.....	60	20	33.4	1.09	Wolfsborough.....	.....	.....	.....	5.09
Virginia City.....	57	2	32.0	0.51	<i>New Jersey.</i>	.....	.....	.....	.....
<i>Nebraska.</i>	.....	.....	.....	.....	Allaire.....	76	8	37.8	.....
Anahey.....	72	0	33.0	1.20	Asbury Park.....	69	9	36.8	7.16
Craigton.....	61	4	27.5	0.82	Belleville.....	.....	.....	.....	6.80
Calbertson.....	63	6	.....	0.05	Beverly.....	77	8	37.6	6.67
David City.....	64	6	.....	0.25	Billingsport L. H.....	73	11	38.2	.....
De Soto.....	62	2	30.8	1.47	Bridgeton.....	74	14	42.0	.....
Fairbury.....	60	10	.....	0.04	Cape May C. H.....	71	10	40.4	4.33
Falls City.....	75	2	39.0	.....	Egg Harbor City.....	75	8	38.5	5.58
Fort Niobrara.....	71	22	29.5	1.31	Freehold.....	73	3	39.4	6.43
Fort Omaha.....	70	4	34.3	1.97	Gillette.....	71	6	35.0	4.73
Fort Robinson.....	70	4	36.7	1.54	Hanover.....	73	9	39.4	.....
Fort Sidney.....	75	3	38.3	.....	Highland Park.....	72	6	35.5	6.80
Franklin.....	72	9	35.2	.....	Hopewell.....	.....	.....	.....	5.72
Fronton.....	62	7	30.9	1.61	Imaystown.....	78	6	.....	4.14
Genoa.....	64	1	31.6	1.16	Junction.....	71	8	36.7	6.27
Gering.....	71	11	37.4	0.37	Lambertville.....	73	6	35.7	7.00
Grand Island.....	62	2	28.2	0.23	Locktown.....	72	5	35.0	5.48
Hay Springs.....	71	1	33.2	1.01	Madison.....	74	9	37.2	6.08
Howe.....	70	4	33.4	4.12	Moorestown.....	68	4	35.8	6.61
Kennedy.....	75	10	34.6	0.82	Newark (1).....	68	4	35.8	7.19
Kimball.....	73	3	34.6	T.	New Brunswick (1).....	69	12	37.9	7.39
Lexington.....	67	0	31.9	0.16	New Brunswick (2).....	71	6	36.6	5.97
Marquette (1).....	72	2	.....	0.47	New Brunswick (3).....	72	6	36.9	.....
Minden.....	70	2	34.0	0.93	Ocean City.....	63	12	39.7	4.80
Mullen.....	64	0	29.2	0.41	Oceanic.....	73	12	39.2	5.87
Nebraska City.....	69	2	32.8	1.51	Princeton.....	69	6	36.2	5.35
North Loup.....	64	1	32.5	0.70	Ranocas.....	74	8	.....	6.39
Oakdale.....	64	4	29.9	1.38	Readington.....	708	89	38.67	.....
Palmer.....	64	0	29.2	0.40	South Orange.....	72	6	34.8	6.71
Plattsmouth.....	69	2	34.1	0.83	Tenafly.....	73	0	34.4	7.92
Havenna.....	61	0	31.1	0.73	Trenton.....	72	7	40.0	7.47
Sargent.....	71	0	32.4	1.00	Union.....	68	7	35.1	5.17
Syracuse.....	66	6	33.3	1.24	Woodbury.....	74	13	40.6	5.32
Tecumseh.....	637	49	33.09	1.10	<i>New Mexico.</i>	.....	.....	.....	.....
Tekamah.....	63	16	40.5	2.60	Albuquerque.....	75	13	48.4	.....
Weeping Water.....	65	2	30.3	1.50	Chama.....	64	4	36.6	1.64
Weston.....	72	5	32.2	1.68	Coolidge.....	61	9	34.0	.....
West Point.....	62	7	.....	3.00	Deming.....	85	34	58.4	0.00
<i>Nevada.</i>	.....	.....	.....	.....	Fort Bayard.....	76	14	47.6	0.11
Austin.....	57	7	36.8	2.98	Fort Marcy.....	66	5	40.7	0.43
Belmont.....	53	10	34.4	0.77	Fort Selden.....	90	15	55.4	0.02
Beowawe.....	67	14	40.5	0.90	Fort Stanton.....	75	5	40.3	0.01
Brown's.....	70	14	46.8	0.71	Fort Union.....	70	4	32.1	0.14
Burner's Ranch.....	.....	.....	.....	2.05	Fort Wingate.....	65	4	42.4	2.70
Candelaria.....	61	18	40.9	T.	Galinas Springs.....	74	14	50.0	0.12
Carson City.....	66	10	39.7	1.12	Hillaborough.....	80	15	51.4	T.
Columbus Marsh.....	72	3	40.2	0.00	Lordsburg.....	81	25	55.8	0.00
Crane's Ranch.....	.....	.....	.....	3.14	Los Lunas.....	80	19	49.0	1.35
Downeyville.....	66	16	42.6	0.50	Nogal.....	.....	.....	.....	0.24
El Dorado.....	52	40	61.6	2.15	Red Canon.....	77	10	47.8	0.17
Elko (1).....	58	8	36.9	2.92	Roswell.....	72	11	42.4	0.06
Elko (2).....	62	15	34.0	0.90	Springer.....	.....	.....	.....	0.03
Ely.....	60	1	38.2	0.20	<i>New York.</i>	.....	.....	.....	.....
Eureka.....	60	3	35.8	2.61	Adelpi Academy.....	66	10	39.2	.....
Fenelon.....	75	10	39.5	3.80	(Brooklyn).....	.....	.....	.....	3.01
Genoa.....	65	10	39.2	0.66	Alfred Centre.....	57	6	26.2	2.63
Goldsboro.....	66	26	41.5	1.35	Angelica.....	60	14	26.6	2.03
Halleck.....	60	4	36.0	0.30	Ardenia.....	65	5	34.2	5.03
Hartons Ranch.....	59	10	34.6	0.07	Boyd's Corners.....	67	1	34.1	5.66
Hawthorne (1).....	68	32	49.5	1.10	Brookport.....	58	10	30.7	3.43
Hawthorne (2).....	68	18	40.3	0.05	Brookfield.....	58	13	25.9	4.11
Hot Springs (1).....	60	15	36.0	0.00	Canton.....	50	4	27.1	1.68
Hot Springs (2).....	60	15	33.8	.....	Constableville.....	51	14	22.5	3.02
Humboldt.....	62	4	38.4	2.40	Cooperstown.....	61	15	26.3	4.17
Lewers Ranch.....	66	14	39.5	4.39	Davids Island.....	68	4	33.5	5.90
Mill City.....	50	10	41.1	3.15	Eden.....	60	2	31.0	4.85
Palisade.....	60	2	35.6	3.25	Elmora.....	56	3	31.4	2.48
Palmetto.....	60	15	37.6	0.80	Factoryville.....	59	8	28.6	3.33
Pioche.....	70	.....	.....	0.20	Fleming.....	59	3	27.7	2.39
Punch Bowl.....	50	7	30.8	0.80	Fort Columbus.....	68	8	38.8	6.43
Reno.....	60	14	39.6	0.39	Fort Hamilton.....	67	7	36.8	6.31
Reno State Univ.....	64	12	39.6	0.39	.....	.....	.....	.....	.....

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>New York—Cont'd.</i>	o	o	o	<i>Ins.</i>	<i>Ohio—Cont'd.</i>	o	o	o	<i>Ins.</i>
Fort Niagara.....	57	7	31.3	1.56	Demos.....	64	0	32.6	7.42
Fort Porter.....	49	10	30.7	1.96	Elyria.....	60	3	32.3	4.14
Fort Schuyler.....	65	3	33.4	7.23	Findlay.....	60	2	32.7	3.94
Fort Wadsworth.....	74	7	37.6	6.07	Fostoria.....	62	4	33.8	4.22
Geneva.....	59	3	30.7	3.05	Garrettsville.....	60	11	29.3	3.48
Hess Road Station.....	54	5	27.5	2.00	Georgetown.....	66	2	36.6	7.25
Honeyhead Brook.....	65	1	27.4	4.30	Gratiot.....	62	5	35.5	5.61
Humphrey f.....	57	4	28.7	3.34	Greenville.....	58	4	34.1	3.99
Illion f.....	64	10	28.7	3.93	Hanging Rock.....	69	3	37.7	8.40
Ithaca.....	60	3	30.7	3.82	Hassan.....	72	3	32.6	6.00
Keene Valley.....	60	3	25.3	1.49	Hiram.....	58	0	28.8	3.76
Kendall.....	63	8	33.4	2.05	Jacksonborough.....	68	2	34.4	5.65
Kingston.....	70	0	31.4	5.77	Jefferson.....	59	4	29.0	5.02
Le Roy.....	55	0	25.8	3.31	Kent.....	60	1	34.8	4.45
Lyons.....	57	6	30.4	0.94	Kenton f.....	63	6	33.8	4.68
Madison Barracks.....	48	5	27.4	3.02	Leipsic.....	66	3	34.3	4.49
Marshall.....	63	9	29.8	3.43	Logan.....	67	3	35.3	6.61
Middleburgh.....	70	11	30.4	4.31	Lordstown.....	63	13	26.8	3.81
Middletown.....	64	5	31.2	4.26	Mansfield f.....	67	2	35.1	4.87
New Lisbon.....	58	17	25.4	3.86	Marietta (1).....	67	2	37.1	6.32
North Hammond f.....	50	2	27.1	1.81	Marietta (2).....	65	1	35.8	5.33
Number Four f.....	50	17	23.3	3.24	McConnelsville.....	67	1	35.8	5.33
Ogdenburgh.....	48	8	23.8	4.48	Napoleon f.....	62	9	34.5	2.55
Oxford.....	57	14	25.7	4.48	New Alexandria.....	62	1	33.4	5.47
Palermo f.....	55	5	27.8	1.49	New Comers town.....	66	2	33.4	5.39
Palmyra.....	62	10	32.4	6.01	North Lewisburgh.....	66	2	35.0	4.90
Peekskill.....	72	2	31.6	6.01	Oberlin.....	59	0	32.1	4.14
Pendleton Centre f.....	73	0	27.0	2.18	O. S. University.....	63	4	34.3	4.84
Perry City.....	62	8	27.2	4.05	Orangeville f.....	61	14	29.6	2.60
Plattsburgh B'ks.....	53	6	28.9	2.63	Ottawa.....	61	11	29.6	4.45
Plattsburgh.....	52	2	27.8	1.32	Poland.....	61	8	29.8	3.20
Port Jervis.....	64	1	29.5	5.66	Pomeroy.....	69	8	40.6	6.47
Potsdam.....	50	2	25.7	4.40	Portsmouth (1) f.....	68	10	39.9	8.42
Poughkeepsie.....	70	4	31.4	5.51	Portsmouth (2).....	68	11	33.5	3.26
Quaker Street.....	63	7	25.7	4.28	Salineville f.....	62	11	33.7	3.15
Queensbury.....	55	21	25.7	3.45	Shiloh.....	60	5	33.7	3.15
Rome.....	52	14	27.9	4.00	Sidney f.....	61	5	31.2	4.30
Setauket.....	69	8	35.4	6.56	Springborough.....	61	5	31.2	4.30
Sherman.....	56	16	27.3	3.99	Tiffin.....	61	4	34.1	3.86
South Canisteo.....	63	6	27.4	4.33	Upper Sandusky.....	59	4	28.8	3.59
South Kortright f.....	64	20	26.0	3.22	Vienna f.....	57	10	28.8	3.56
Turin.....	49	13	22.2	3.30	Wapakoneta.....	58	4	33.8	9.58
Utica.....	58	10	29.0	4.15	Wauseon.....	61	0	30.8	3.45
Waterloo Arsenal.....	65	8	23.9	3.85	Waverly.....	66	10	39.3	6.70
Wedgewood.....	66	1	26.5	4.09	Waynesville.....	62	3	38.2	5.95
West Point.....	68	1	31.2	5.91	Westerville.....	62	5	33.9	4.51
White Plains.....	66	4	35.5	5.20	West Milton f.....	67	4	37.8	4.73
Willets Point.....	69	6	35.9	4.32	Weymouth.....	60	4	29.8	4.60
<i>North Carolina.</i>					Wooster f.....	60	1	30.9	4.37
Asheville (1).....	72	11	42.6	1.89	Yellow Springs.....	61	2	33.1	5.35
Asheville (2).....	72	11	42.6	1.89	Youngstown.....	60	2	33.1	4.38
Bryson City.....	72	11	42.6	1.89	Zanesville.....	60	2	33.1	4.38
Chapel Hill.....	77	19	49.8	3.80	<i>Oregon.</i>				
Clear Creek.....	78	15	51.0	3.00	Albany.....	60	29	45.6	6.86
Curriack Inlet.....	77	13	46.4	2.46	Ashland (1).....	63	28	43.1	3.37
Douglas.....	77	13	46.4	2.46	Ashland (2).....	62	21	41.7	3.00
Franklin.....	75	11	43.1	3.40	Bandon.....	62	32	46.2	11.65
Highlands.....	68	4	39.6	7.82	Burns.....	68	0	35.6	0.15
Hot Springs.....	76	18	46.1	4.30	Cascade Locks.....	59	28	40.7	7.10
Lenoir.....	70	19	44.4	3.74	Corvallis.....	73	27	46.0	5.67
Mount Airy.....	74	18	43.6	4.30	Creswell.....	70	32	47.4	6.72
Mount Holly f.....	73	18	48.2	3.01	Dufur.....	62	24	39.1	0.43
Mount Pleasant.....	73	18	48.2	3.01	East Portland.....	62	24	39.1	1.83
Murphy.....	82	19	53.6	2.82	Eola.....	62	20	43.4	4.26
New Berne f.....	72	16	44.1	1.93	Forest Grove.....	60	22	43.4	4.84
Oak Ridge.....	76	18	46.9	3.41	Gardiner.....	63	34	46.8	10.12
Pittsborough.....	74	24	48.8	2.75	Grant's Pass.....	71	24	44.8	4.68
Salisbury.....	74	24	48.8	2.75	Heppner.....	68	9	41.2	2.75
Soapstone Mount.....	75	18	45.1	4.30	Hood River.....	65	19	43.2	3.14
Washington.....	79	28	51.2	4.07	Hubbard.....	71	23	43.2	6.14
Weldon.....	78	20	47.7	5.07	Jacksonville.....	64	27	43.3	3.25
Wilmington.....	81	17	49.4	1.90	Jordan Valley.....	60m	4m	36.1m	3.14
Winslow.....	79	19	51.6	2.30	Joseph.....	52	3	31.2	1.75
<i>North Dakota.</i>					La Grande.....	61	24	40.2	2.29
Davenport.....	45	28	30.4	0.38	Lone Rock.....	62	8	38.7	3.05
Fort A. Lincoln.....	51	30	19.2	0.30	McMinnville.....	61	24	43.4	6.19
Fort Buford.....	50	18	22.6	0.58	Mount Angel.....	64	30	43.5	6.25
Fort Pembina.....	47	30	11.1	0.27	North Powder.....	56	9	37.0	0.60
Fort Totten.....	49	26	14.4	0.27	Lonsdale.....	70	10	42.0	2.04
Fort Yates.....	56	19	24.6	0.22	Saint Helens.....	61	26	43.7	4.40
Gallatin.....	44	36	12.7	0.21	Silver Lake.....	60	9	36.2	1.04
Napoleon.....	49	24	19.7	0.10	Siskiyou.....	55	22	40.3	5.75
New England City.....	60	19	24.2	0.03	The Dalles.....	62	16	42.2	1.89
Sanborn.....	41	36	13.8	0.62	Tillamook.....	58	32	43.8	9.10
Steele.....	48	26	15.6	1.35	Toledo.....	72	30	47.0	7.10
Wahpeton.....	55	26	21.8	0.30	Vernonia.....	60	28	40.3	5.38
<i>Ohio.</i>					Weston.....	66	14	40.4	2.98
Akron.....	59	4	31.3	4.03	<i>Pennsylvania.</i>				
Ashland.....	60	4	32.7	3.89	Allegheny Arsenal.....	69	2	36.1	4.01
Athens.....	67	1	36.6	6.38	Altoona.....	68	2	37.9	2.90
Bangorville.....	60	2	31.1	5.11	Annville.....	77	6	37.7	2.90
Bellevue.....	58	4	31.4	4.40	Aqueduct.....	74	7	36.9	5.57
Bement.....	60	3	31.1	3.37	Bethlehem.....	71	2	36.0	6.12
Bucyrus.....	60	3	32.2	4.40	Blooming Grove.....	67	2	31.6	8.50
Caledonia f.....	62	0	32.2	3.73	Blue Knob.....	68	7	27.3	5.04
Canton f.....	62	0	32.2	3.73	Brookville.....	67	9	33.0	4.48
Carrollton.....	63	5	35.1	3.50	Cannonsburgh.....	67	9	33.0	4.48
Circleville (1) f.....	63	5	35.1	3.50	Carlisle.....	74	6	36.0	5.87
Circleville (2).....	63	5	35.1	3.50	Centre Valley.....	76	11	38.4	5.04
Clarksville.....	63	3	34.9	6.57	Charlesville.....	74	18	34.0	5.46
Cleveland.....	62	6	33.2	3.82	Clarion (1) f.....	59	10	28.2	3.98
College Hill.....	78	5	39.6	7.67	Clarion (2).....	76	6	36.4	7.29
Columbus Barracks.....	64	4	35.9	4.69	Coatesville.....	76	6	36.4	7.29
Dayton.....	64	3	36.9	4.34	Confidence f.....	73	5	34.9	7.92

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Pennsylvania—Con.</i>					<i>South Carolina—Con.</i>				
Corry.....	58	16	28.8	4.33	Yorkville.....	78	16	53.0	3.79
Coudersport.....	55	19	27.3	4.20	<i>South Dakota.</i>				
Drifton.....	64	1	28.9	4.81	Aberdeen.....	47	20	22.6	0.18
Doylstown.....	66	4	27.5	5.09	Alexandria.....	55	14	26.5	1.10
Dyberry.....	66	4	27.5	5.09	Canton.....	54	12	25.2	2.30
Eagle's Mere.....	54	3	26.3	7.61	Clark.....	59	16	23.2	0.41
Easton.....	58	6	27.4	6.39	Cross.....	59	4	29.4	1.84
Edinborough.....	58	6	27.4	6.39	De Smet.....	38	11	21.4	0.41
Emporium.....	57	13	33.3	4.79	Flandreau.....	68	15	30.5	0.42
F's of Neshaminy.....	57	13	33.3	4.79	Fort Bennett.....	68	13	30.5	0.42
Franklin.....	58	8	29.1	4.78	Fort Meade.....	64	1	32.0	1.24
Frankford Arsenal.....	74	7	39.6	4.45	Fort Randall.....	65	3	30.4	1.19
Frederick.....	64	3	26.3	6.43	Fort Sully.....	68	11	31.3	0.39
Freeport f.....	64	3	26.3	6.43	Highmore.....	62	17	22.7	0.30
Gettysburgh f.....	67	5	33.4	5.25	Kinball.....	60	10	24.2	0.87
Girardville.....	62	14	28.4	5.19	Kirchman.....	69	12	33.6	1.12
Grampian Hills.....	69	4	35.1	5.54	Onida.....	56	2	23.1	0.41
Greensborough f.....	61	8	30.1	5.12	Parkston.....	56	12	25.6	0.43
Greensburg.....	61	8	30.1	5.12	Scranton.....	66	13	26.6	1.47
Holidaysburgh.....	63	16	33.4	4.48	Spearfish.....	66	3	33.3	1.54
Honesdale.....	64	1	30.4	4.48	Vermillion.....	57	10	25.6	0.82
Huntingdon.....	62	5	34.9	3.61	Webster.....	51	23	23.5	1.67
Indiana.....	66	8	34.4	4.67	Wolsey.....	52	18	26.4	0.29
Johnstown.....	68	4	34.3	5.74	Woonsocket.....	54	16	24.4	0.71
Kennett Square.....	64	7	34.8	4.76	<i>Tennessee.</i>				
Lancaster.....	76	4	36.3	4.84	Andersonville.....	74	16	43.7	6.25
Lansdale.....	61	0	29.3	5.33	Arlington f.....	70	16	46.8	7.90
Le Roy.....	61	0	29.3	5.33	Ashwood f.....	73	16	46.8	7.81
Lewisburgh.....	61	3	34.5	5.21	Austin f.....	70	16	45.4	9.56
Lock Haven.....	51	12	32.9	5.48	Carthage f.....	73	16	45.4	9.56
Lock No. 4 f.....	71	4	34.8	5.30	Charleston f.....	75	13	44.6	10.29
Lynnport.....	71	4	34.8	5.30	Clarksville.....	75	13	44.6	10.29
Mahoning f.....	72	6	34.0	5.33	Clinton.....	80	21	48.3	3.40
Mauch Chunk.....	72	6	34.0	5.33	Cog Hill.....	80	21	48.3	3.40
McConeillsburgh.....	71	3	37.0	5.41	Columbia f.....	77	18	48.7	6.31
Meadville (2).....	58	3	28.2	4.81	Covington (1).....	67	16	40.0	7.14
Meshoppen.....	73	3	28.6	6.46	Cumberland Gap.....	77	16	40.0	7.14
Myerstown.....	73	2	35.3	6.46	Dunlap.....	78	16	47.9	4.36
New Bloomfield.....	68	1	34.3	5.87	Dyersburgh.....	77	13	46.0	6.38
New Castle.....	65	3	34.1	4.29	Fayetteville.....	75	18	49.0	7.42
Nisbet.....	65	2	32.8	4.30	Florence Station.....	69	18	46.1	2.20
Oil City.....	61	0	29.3	5.33	Grand Junction.....	72	18	43.2	7.36
Ottaville.....	61	0	29.3	5.33	Greeneville.....	72	18	43.2	5.09
Parker's Landing f.....	61	0	29.3	5.33	Grief.....	72	16	47.9	5.27
Petersburgh.....	66	21	30.4	3.83	Hohenwald.....	75	16	46.6	8.87
Phillipsburgh f.....	66	21	30.4	3.83	Jacksborough.....	70	15	44.2	6.47
Pleasant Mount.....	66	0	25.8	4.88	Johnsonville f.....	71	17	47.3	9.40
Point Pleasant.....	73	5	38.0	8.05	Kingston (1).....	73	10	46.7	7.82
Pottstown.....	76	4	38.8	8.31	Kingston Springs.....	72	19	46.2	7.86
Quakertown.....	73	4	38.8	8.31	Lawrenceburgh.....	73	10	46.7	7.82
Reading.....	75	9	35.5	4.88	Lewisburgh.....	73	19	46.2	7.86
Rimersburgh.....	70	8	28.7	6.82	Loudon.....	70	10	43.4	6.94
Salem Corners.....	62	0	28.0	6.82	Lynnville.....	70	10	43.4	6.94
Saltsburgh f.....	78	18	37.0	5.54	Maryville.....	78	19	46.5	9.25
Seisholtzville.....	68	1	34.3	5.87	McKenzie.....	78	18	47.7	9.25
Smith's Corners.....	68	1	34.3	5.87	Milan (1).....	77	15	43.4	8.41
Somerset.....	65	17	38.0	5.42	Nunnely.....	72	15	43.4	8.41
South Easton.....	65	5	31.3	4.46	Parksville.....	74	18	48.0	5.88
State College.....	74	6	30.7	3.85	Riddleton.....	75	16	46.1	7.65
Swarthmore.....	73	8	37.6	5.20	Rockwood f.....	72	19	43.6	5.90
Tipton.....	68	14	32.0	3.90	Rogersville.....	69	13	41.2	6.87
Troy.....	64	5	30.2	3.71	Rugby.....	74	22	50.0	9.30
Tuscarora.....	70	2	39.3	3.88	Savannah.....	72	18	47.7	7.85
Uniontown.....	74	10	37.3	6.27	Sharp's.....	70	18	44.2	7.63
Warren.....	64	9	27.8	6.03	Springdale.....	73	16	48.8	4.15
Waynesburgh.....	73	5	37.0	6.77	Strawberry Plains f.....	75	10	45.4	8.31
Wellsborough.....	73	5	37.0	6.77	Trenton.....	75	10	45.4	8.31
West Chester.....	74	8	37.6	4.68	Watkins.....	75	16	45.3	8.66
Westtown.....	71	7	34.6	4.80	Waynesborough.....	72	20	47.6	7.88
Wilkes Barre.....	74	10	37.3	6.27	Woodstock.....	73	16	48.8	4.15
Wysox.....	64	4	30.3	3.38	<i>Texas.</i>				
York.....	75	4	35.8	5.44	Austin (1).....	89	22	62.5	0.58
<i>Rhode Island.</i>					Austin (2).....	91	25	62.6	0.61
Bristol.....	56	6	35.0	8.14	Brady.....	84	24	62.2	0.61
Fort Adams.....	56	5	34.9	4.26	Brazoria f.....	90	23	64.9	3.41
Kingston (1).....	57	5	35.3	8.03	Brenham f.....	91	17	58.4	0.61
Kingston (2).....	57	3	33.8	8.45	Caddo Peak.....	89	30	55.7	0.44
Lonsdale.....	62	10	36.6	7.18	Camp Del Rio.....	105	10	57.8	0.08
Newport.....	62	10	36.6	7.18	Camp Eagle Pass.....	105	20	66.6	0.08
Olneyville.....	72	5	36.6	7.18	C'p Pena Colorado.....	87	17	56.9	0.20
Pawtucket.....	66	6	34.8	8.27	Childress.....	100	10	55.2	T.
Providence (1).....	66	6	34.8	8.27	College Station.....	90	22	62.0	3.93
Providence (2).....	67	2	33.6	7.12	Columbia Station.....	85	24	60.3	3.88
Woonsocket.....	63	2	33.1	5.55	Corsicana (1).....	88	36	70.0	2.82
<i>South Carolina.</i>					Dallas (1).....	87	18	57.5	1.75
Aiken.....	82	25	53.8	5.10	Dallas (2).....	90	30	56.4	1.74
Belmont.....	78	19	49.8	2.78	Decatur f.....	92	18	54.3	2.14
Cheraw f.....	83	21	54.6	3.64	Duval.....	93	36	63.0	0.15
Conway.....	80	30	55.9	2.19	Edinburgh f.....	82	30	54.5	0.14
Evergreen.....	74	18	45.1	3.41	Epworth f.....	86	31	57.5	4.40
Florence.....	74	18	45.1	3.41	Fort Bliss.....	89	29	68.2	0.00
Greenville f.....	85	24	57.2	2.40	Fort Brown.....	85	19	63.2	0.02
Greenwood f.....	85	24	57.2	2.40	Fort Elliott.....	88	14	49.7	0.00
Hardeeville.....	78	20	48.6	2.80	Fort Hancock.....	91	10	55.3	0.00
Jacksonsborough.....	75	22	49.3	3.32	Fort Mcintosh.....	99	23	67.0	0.20
Kirkwood.....	75	27	56.6	2.25	Fort Ringgold.....	105	20	68.0	0.50
Roy f.....	83	18	43.9	4.33	Fort Worth.....	90	22	62.0	2.60
Simpsonville.....	76	11	49.0	3.69	Fredericksburgh.....	91	22	58.8	0.41
Spartanburgh (1).....	72	20	48.2	3.79	Gainesville.....	87	17	55.6	3.52
Spartanburgh (2) f.....	83	22	53.6	3.53	Gallinas.....	98	16	62.3	0.54
Statesburgh.....	82	22	53.6	3.53	Graham f.....	93	13	55.3	0.54
Trial.....	83	22	53.6	3.53					
Winhall.....	71	28	50.6	2.35					
Winnabowh.....	79	18	49.2	1.98					

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
Texas—Cont'd.					Virginia—Cont'd.				
Hartley.....	82	11	45.4	0.00	Smithfield.....	82	34	48.1	3.38
Houston.....	86	23	61.2	3.94	Spottsville.....	80	30	46.8	4.95
Howe.....	89	21	54.5	3.92	Staunton.....	76	12	40.0	0.60
Huntsville.....	88	24	61.6	4.38	Summit.....	74	12	39.8	2.65
La Grange.....	85	29	63.6	2.75	University of Va.....	.....	.....	.....	3.99
Lampasas.....	95	19	60.1	0.55	Woodstock.....	.....	.....	.....	.....
Longview.....	88	19	58.1	4.07	Washington.				
Menardville.....	93	22	54.8	0.00	Blakeley.....	58	30	45.0	2.90
Merkel.....	90	20	52.6	1.81	Doe Bay.....	56	30	43.2	3.00
Mesquite.....	91	18	57.6	1.60	Fort Canby.....	60	34	45.9	5.80
Miami.....	.....	.....	.....	0.02	Fort Spokane.....	55	11	30.0	0.58
Mountain Spring.....	40	58.0	3.30	.....	Fort Townsend.....	50	25	43.1	2.17
New Braunfels.....	97	22	64.9	1.01	Fort Walla Walla.....	67	2	42.0	2.59
New Ulm.....	90	21	62.5	2.07	Vancouver B'ks.....	65	23	45.5	4.49
Ochiltree.....	71	19	43.1	1.00	Waterville.....	64	7	35.4	1.16
Panhandle.....	87	5	47.4	0.00	West Indies.				
Pike.....	87	34	67.1	0.60	Havana.....	72	50	64.1	3.38
Round Rock.....	86	23	61.7	0.70	San Juan.....	70	36	76.3	0.72
San Antonio.....	93	21	64.2	1.05	West Virginia.				
Santa Maria.....	.....	.....	.....	0.00	Buckhannon.....	.....	.....	.....	7.62
Silver Falls.....	93	14	55.8	0.40	Charleston.....	.....	.....	.....	8.90
Tyler.....	88	20	58.0	0.00	Ella.....	63	2	34.0	5.53
Waco (2).....	89	18	60.2	2.40	Glennville.....	.....	.....	.....	7.54
Utah.					Harper's Ferry.....	.....	.....	.....	2.87
Beaver.....	69	2	40.7	0.53	Hinton.....	.....	.....	.....	1.95
Blue Creek.....	57	12	41.0	1.80	Kingwood.....	68	10	30.5	.....
Corinne.....	64	0	39.4	1.70	Morgantown.....	70	5	39.2	5.84
Fort Douglas.....	64	0	39.5	1.12	Ocean.....	68	5	30.2	7.48
Fort Duchesne.....	64	4	37.0	0.02	Pleasant Hill.....	.....	.....	.....	7.54
Levan.....	8	8	35.6	1.45	Rowlesburgh (1).....	.....	.....	.....	4.46
Losee.....	50	10	36.6	0.55	Rowlesburgh (2).....	.....	.....	.....	.....
Moab.....	74	8	45.4	0.68	Seven Pines.....	60	3	35.5	.....
Mount Carmel.....	13	35.2	1.33	.....	Tannery.....	71	14	33.4	.....
Mount Pleasant.....	43	4	36.8	2.30	Tyler Creek.....	68	6	40.7	4.33
Nephi.....	69	10	38.4	0.83	Weston.....	.....	.....	.....	4.80
Ogden (2).....	65	0	42.4	1.74	Wheeling.....	.....	.....	.....	5.26
Ogden (1).....	62	10	35.6	4.23	White Sulph' Sp'gs.....	.....	.....	.....	7.72
Ogilby.....	95	53	71.4	0.00	Wisconsin.				
Price.....	.....	.....	.....	0.02	Butternut.....	.....	.....	.....	18.2
Promontory.....	62	10	38.2	0.40	Cadiz.....	.....	.....	.....	24.8
Richfield.....	72	18	40.8	0.61	Chippewa Falls.....	.....	.....	.....	1.71
Saint George.....	76	21	51.6	1.47	Delavan.....	46	20	25.1	1.45
Terrace.....	68	2	40.0	0.35	Embarrass.....	48	25	22.0	2.00
Vermont.					Glasgow.....	.....	.....	.....	0.55
Brattleborough (1).....	56	6	30.2	5.11	Greenwood.....	60	30	21.7	2.59
Brattleborough (2).....	57	1	30.7	.....	Haywood.....	46	23	17.4	0.80
Burlington.....	53	2	30.7	.....	Honey Creek.....	54	30	25.2	2.03
Chelsea.....	48	5	26.4	2.93	Horicon.....	.....	.....	.....	1.30
Cornwall.....	.....	.....	.....	.....	Lincoln.....	.....	.....	.....	1.64
East Berkshire.....	47	19	35.8	2.40	Madison.....	49	13	25.3	3.38
Hartland.....	49	14	28.0	3.47	Manitowoc.....	47	13	29.0	1.93
Jacksonville.....	60	9	37.9	5.48	Medford.....	.....	.....	.....	1.76
Lanesburgh.....	48	12	27.3	4.14	Neillsville.....	45	34	22.0	.....
Stratford.....	48	6	25.8	3.70	Oshkosh.....	45	16	24.7	1.67
Vernon.....	50	8	30.5	5.17	Phillips.....	.....	.....	.....	1.40
Weatherford C'tre.....	54	10	26.0	.....	Portage.....	.....	.....	.....	1.80
Virginia.					Summit Lake.....	60	20	19.3	2.32
Abingdon.....	.....	.....	.....	4.62	Waukegan.....	.....	.....	.....	1.00
Alexandria.....	.....	.....	.....	1.17	Waukegan.....	.....	.....	.....	27.8
Birdsneat.....	82	20	46.4	3.65	Wyoming.				
Bolar.....	62	0	31.5	3.15	Camp Pilot Butte.....	59	12	32.8	0.46
Christiansburg.....	71	13	44.8	2.30	Camp Sheridan.....	.....	.....	.....	4.92
Dale Enterprise.....	75	10	41.2	3.44	Carbon.....	54	4	30.6	0.59
Fall Creek Depot.....	71	22	49.5	3.00	Carter.....	.....	.....	.....	0.90
Fort Monroe.....	76	22	47.2	3.44	Fort Bridger.....	57	12	30.4	0.75
Fort Myer.....	76	12	41.1	3.38	Fort D. A. Russell.....	67	15	33.2	0.44
Lexington.....	75	14	41.0	4.02	Fort McKinney.....	63	1	35.0	1.00
Liberty.....	.....	.....	.....	.....	Fort Washakie.....	62	5	34.4	0.78
Marion.....	72	12	42.0	4.16	Lander.....	60	1	34.5	0.40
Mossingford.....	.....	.....	.....	.....	Lusk.....	62	8	33.0	1.87
Nottaway C. H.....	79	13	44.8	3.85	Saratoga.....	53	7	30.9	1.30
Petersburg.....	77	20	45.6	3.57	Wheatland.....	47	.....	.....	1.02
Richmond.....	87	16	47.5	3.49					
Salem.....	69	21	42.4	3.00					

Reports received too late for publication in February, 1890.

Alaska.					California—Cont'd.				
Killiknoo.....	41	1	30.0	4.60	Livermore.....	80	30	49.0	3.71
Arizona.					Los Gatos.....	73	30	49.9	7.12
American Flag.....	.....	.....	.....	2.60	Needles.....	74	37	53.6	0.00
Bisbee.....	.....	.....	.....	0.27	Ontario.....	83	40	56.9	2.03
Calabasas.....	.....	.....	.....	0.38	Pleasanton.....	76	30	50.7	2.93
Chloride.....	.....	.....	.....	1.05	Pomona.....	70	32	49.7	2.65
Cottonwood.....	.....	.....	.....	3.90	Porterville.....	68	32	48.2	0.49
Dudleyville.....	.....	.....	.....	1.46	Stockton.....	.....	.....	.....	1.98
Flagstaff.....	59	4	34.0	4.20	Tropico.....	.....	.....	.....	4.16
Fort Verde.....	.....	19	.....	0.48	Canada.				
Oro.....	.....	.....	.....	0.21	McGill Coll. Obs'y.....	.....	.....	.....	.....
Payson.....	.....	.....	.....	3.62	Montreal.....	45	9	19.1	4.45
Silver.....	.....	.....	.....	2.93	Colorado.				
Simmons.....	.....	.....	.....	0.45	Montezuma Valley.....	71	11	40.4	1.25
Stanton.....	.....	.....	.....	2.78	Kansas.				
Tempe.....	.....	.....	.....	0.81	Concordia.....	70	8	28.6	0.22
Wilcox.....	.....	.....	.....	0.29	Massachusetts.				
Wood Canon.....	.....	.....	.....	0.90	Worcester (2).....	56	1	31.4	4.04
Woodruff.....	.....	.....	.....	0.60	Missouri.				
California.					Boonville.....	.....	.....	.....	2.30
Borden.....	75	31	47.1	0.79	Nebraska.				
Dunsmuir.....	52	24	38.5	16.50	Lincoln.....	67	11	25.4	0.40
Elmira.....	.....	.....	.....	4.08	Tecumseh.....	50	12	30.3	0.40
Galt.....	70	29	48.0	3.31	Nevada.				
Lemoore.....	80	30	55.0	0.86	Halleck.....	43	32	33.1	1.65

Reports received too late, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
New Mexico.					Virginia.				
La Luz.....	78	16	47.3	.....	Christiansburg.....	68	10	42.9	.....
North Carolina.					West Indies.				
Mount Pleasant.....	79	28	52.2	3.97	Havana.....	92	62	74.1	1.51
Texas.					Colony Surinam, S.A.				
Santa Maria.....	.....	.....	.....	0.00	Burnside Coronic.....	86	70	77.8	7.17

Reports received too late to be used in general discussion of weather for March, 1890.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean.			Max.	Min.	Mean.	
Alaska.					New Mexico—Cont'd.				
Killiknoo.....	46	16	32.8	4.20	Pojuaque.....	.....	.....	.....	0.39
British Columbia.					San Marcial (near).....	.....	.....	.....	0.05
New Westminster.....	55	28	42.2	5.71	Tres Piedras.....	.....	.....	.....	1.46
California.					Wallace.....	.....	.....	.....	1.45
Arcata.....	.....	.....	.....	11.94	Ohio.				
Colegrove.....	.....	.....	.....	0.68	Lordstown.....	63	12	29.4	3.81
National City.....	76	38	57.0	0.64	Wooster.....	.....	.....	.....	4.20
Needles.....	79	48	62.9	0.21	Oregon.				
Kentucky.					Beulah.....	60	11	37.5	2.12
Cattlettsburgh.....	.....	.....	.....	7.85	Ellensburg.....	61	34	47.4	14.44
Michigan.					Tillamook.....	60	32	43.5	9.10
Berrien Springs.....	55	5	29.4	3.72	Wisconsin.				
Missouri.					Grantsburgh.....	49	23	20.2	2.25
Boonville.....	.....	.....	.....	3.79	Richland.....	52	35	24.9	1.44
Montana.					Mexico.				
Sheldon.....	58	2	36.4	1.04	La Logia.....	90	47	66.0	0.05
Nebraska.					Mazatlan.....	77	61	69.3	T.
Bingham.....	64	3	32.2	1.52	Mexico.....	81	38	58.8	0.10
New Mexico.					Topolobampo.....	82	60	69.7	0.00
Bernalillo.....	.....	.....	.....	1.30	Zacatecas.....	82	34	57.6	0.00
Estalita Springs.....	.....	.....	.....	0.25	West Indies.				
Magdalena.....	.....	.....	.....	0.40	Grand Turk Island.....	82	74	79.6	1.64
Monero.....	.....	.....	.....	1.86					

Letters of the alphabet denote the number of days missing from the record, thus: the letter c indicates three days missing in a thirty-one day month, etc., etc.

*Extremes of temperature from observed readings. †Signal Service instruments. ‡One observation daily at 10.00 a. m. §Rainfall estimated at 14.20. ¶Rainfall estimated at 15.10.

Corrections: Gallatin, N. Dak., for mean temperature, January, 1890, read —5.8 instead of —9.2. Brattleborough, Vt., (1) for mean temperature, February, 1890, read 29.1 instead of 26.1.

Mean temperature (degrees Fahr.) observed at Fort Fillmore, N. Mex., by assistant surgeons, U. S. Army.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1851.....									79.6	63.2	48.2	44.1	60.0
1852.....	39.7	49.7	48.4	56.5	68.7	78.0	79.6	76.4	74.3	59.0	46.0	44.1	60.0
1853.....	41.7	45.0	52.7	65.5	72.5	81.8	85.4	81.4	77.5	65.0	57.5	50.8	64.7
1854.....	48.6	50.4	59.7	66.1	68.6	80.6	85.1	81.2	77.4	70.4	53.2	46.7	65.7
1855.....	50.1	50.6	.....	64.4	75.4	83.2	83.4	82.5	77.2	65.6	53.4	47.0	.....
1856.....	43.3	46.7	57.4	69.0	75.4	85.0	85.0	83.5	75.5	65.6	53.5	41.3	65.1
1857.....	46.7	49.2	61.3	63.9	75.4	83.3	84.8	83.5	73.1	64.1	47.9	41.4	65.0
1858.....	40.0	46.4	53.4	66.8	70.7	80.8	82.7	80.8	78.6	66.3	47.9	40.0	62.7
1859.....	35.1	51.0	52.3	63.1	76.8	85.9	78.1	83.9	74.9	66.2	40.3	33.9	61.8
1860.....	44.9	47.4	58.4	58.3	66.4	74.6	80.0	81.7	75.0	71.2	56.1	45.7	63.3
1861.....	44.4	44.4	54.4	63.8	70.4	.....	.....	.....	.....	.....	.....	.....	.....
Mean.....	43.4	48.0	55.3	63.7	72.0	81.5	82.7	81.5	76.1	65.7	51.1	43.5	63.7

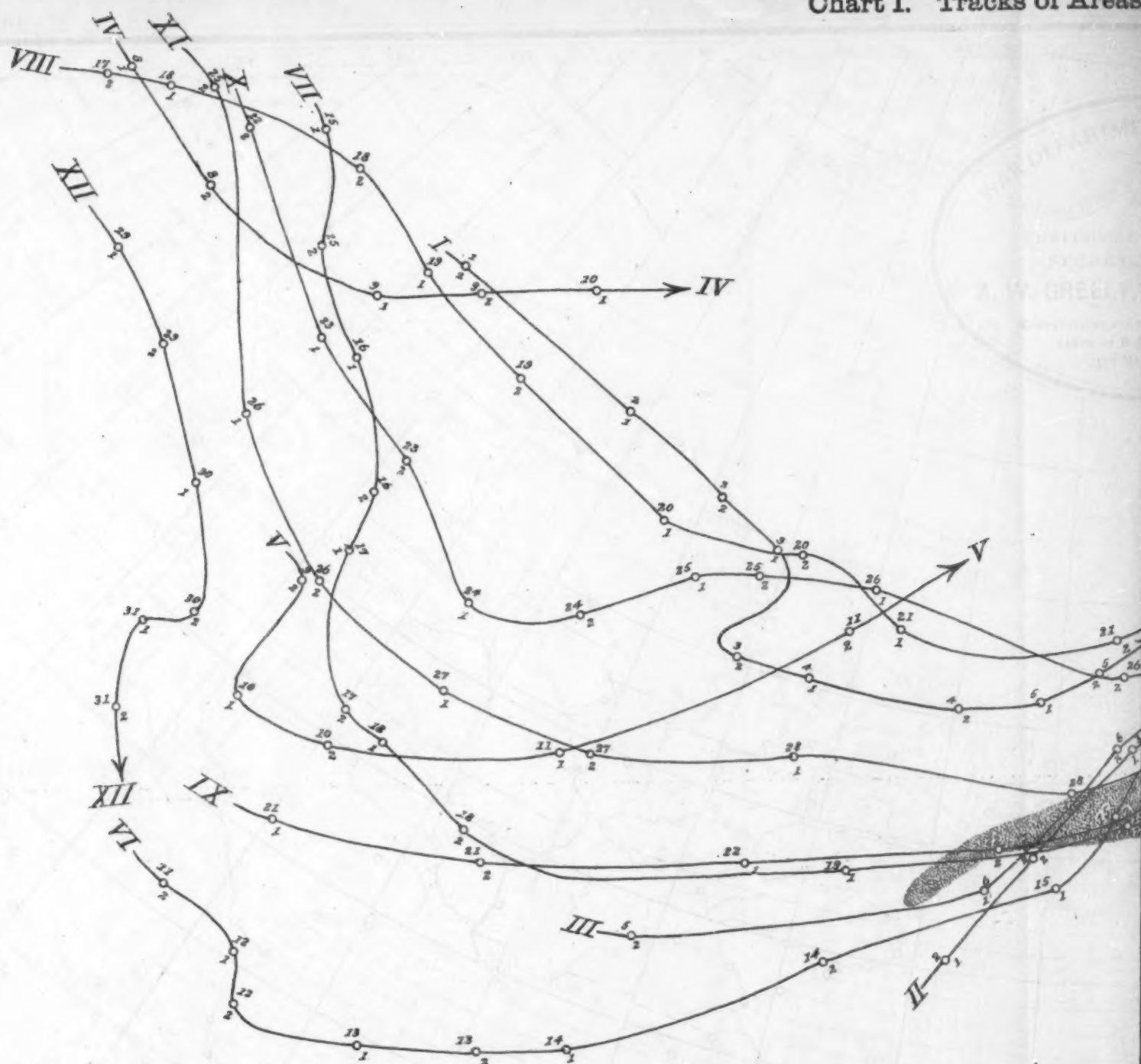
Table of miscellaneous meteorological data for March, 1890—Signal Service observations.

Stations and districts.	Elevation above sea-level, feet.	Pressure, in inches.		Temperature of air, in degrees Fahrenheit.								Mean temperature of the dew-point.		Mean relative humidity, per cent.		Precipitation, in inches.		Departure from normal precipitation.		Wind.			Cloudless days.		Partly cloudy days.		Days with rainfall.		Average cloudiness, tenths.		Length of record, years.		Precipitation data since opening of station.	
		Mean actual.	Mean reduced.	Monthly range.	Monthly mean.	Departure from normal.	Maximum.	Mean maximum.	Minimum.	Mean minimum.	Greatest daily range.	Least daily range.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal precipitation.	Total movement, miles.	Prevailing direction.	Maximum velocity.		Date.	Cloudless days.	Partly cloudy days.	Days with rainfall.	S. a. m.	Average cloudiness, tenths.	Length of record, years.	Greatest for month.	Year.	Least for month.	Year.			
																			Miles per hour.	Direction.														
New England.																																		
Eastport	53	29.83	29.89	1.38	33.5	+1.4	46	34.2	10	24.5	26	1	22.5	76.8	7.11	+2.71	7,957	nw.	46	e.	29	9	7	15	20.6	2.5	3	9.39	1876	1.39	1875			
Portland	99	29.83	29.94	1.19	30.7	+1.3	51	37.0	5	24.4	34	3	22.9	76.0	6.24	+3.01	5,971	nw.	31	s.	5	6	17	19.7	1.5	0	6.24	1890	1.14	1874				
Manchester	247	29.71	29.98	1.10	30.8	.....	54	38.4	—	23.1	47	4	21.8	74.9	5.73	.....	4,912	nw.	24	nw.	10	8	13	18.5	9.5	0	5.73	1890	2.10	1889		
Northfield	872	29.02	30.01	1.02	25.0	.....	59	33.2	—13	16.7	47	5	18.3	78.0	6.53	.....	6,937	n.	36	n.	1	5	10	16	17.6	9.5	4	4.81	1888	2.05	1886	
Boston	125	29.85	29.99	1.14	34.9	+1.9	58	40.6	4	27.0	29	3	25.1	71.6	7.04	+3.64	10,003	nw.	36	e.	28	10	8	13	17.6	3.6	0	9.86	1881	1.15	1885			
Nantucket	14	29.97	29.98	1.20	35.7	.....	54	40.6	14	30.8	18	3	31.6	83.2	6.07	.....	10,015	nw.	48	e.	19	7	11	13	18.6	7.4	4	6.07	1890	2.84	1887	
Wood's Hole	22	29.99	29.98	1.30	34.2	.....	49	39.1	10	29.3	18	3	29.6	83.8	8.39	+3.69	13,647	nw.	48	n.	2	8	11	12	18.5	7.5	2	10.78	1877	1.10	1874		
Vineyard Haven	26	29.99	30.02	1.15	37.6	.....	49	39.1	10	30.2	28	3	29.6	81.8	5.16	+1.05	14,019	nw.	60	do.	19	7	12	13	16.5	6.4	5	8.76	1890	1.90	1889		
Block Island	32	29.99	30.02	1.15	35.4	+1.4	53	40.6	11	30.2	20	5	29.6	81.8	5.16	+1.05	14,019	nw.	60	do.	19	7	12	13	16.5	6.4	5	8.76	1890	1.90	1889			
Narragansett Pier	26	29.99	30.02	1.15	35.4	+1.4	53	40.6	11	30.2	20	5	29.6	81.8	5.16	+1.05	14,019	nw.	60	do.	19	7	12	13	16.5	6.4	5	8.76	1890	1.90	1889			
New Haven	107	29.90	30.02	1.09	34.2	+1.2	67	43.4	3	24.7	31	10	26.5	78.2	6.60	+1.70	5,913	nw.	34	n.	3	3	15	15	16.6	6.4	9	10.42	1881	1.19	1885			
New London	47	29.95	30.00	1.12	34.2	+1.2	64	42.7	4	27.0	28	4	26.5	70.2	6.60	+1.70	5,913	nw.	40	ne.	3	3	14	12	16.6	2.4	9	10.96	1877	1.55	1885			
Mid. Atlantic States.																																		
Albany	85	29.95	30.05	1.06	31.0	+0.0	67	38.5	—4	23.6	32	5	24.9	81.2	3.72	+0.77	6,656	nw.	37	se.	25	5	10	16	18.6	6.6	4	5.62	1888	0.62	1885			
New York City	185	29.83	30.04	1.06	37.5	+1.5	71	44.5	8	30.7	27	5	27.4	72.4	6.07	+2.71	9,705	nw.	38	sw.	29	4	13	14	20.6	1.5	2	7.90	1876	1.19	1885			
Harrisburg	377	29.66	30.06	1.13	35.6	.....	72	42.3	6	29.0	31	4	27.8	74.8	3.80	.....	7,591	nw.	48	nw.	28	5	10	10	14.6	9.5	2	3.80	1890	3.20	1889	
Philadelphia	117	29.94	30.07	1.26	38.8	+0.8	73	46.2	9	31.5	21	3	27.6	68.4	4.61	+1.51	9,935	nw.	36	nw.	29	4	12	15	19.6	7.5	2	6.71	1876	0.69	1885			
Atlantic City	53	30.00	30.05	1.06	38.2	+1.2	63	44.5	10	31.9	26	3	28.0	77.4	5.20	+1.41	10,826	nw.	42	w.	29	8	11	12	13.4	4.3	8	5.97	1880	0.95	1885			
Baltimore	70	29.98	30.07	1.11	41.6	+0.6	77	49.5	12	33.7	33	3	28.4	66.0	4.07	+0.07	4,964	nw.	24	nw.	2	8	13	10	16.5	5.7	3	7.59	1881	1.41	1874			
Washington City	112	29.97	30.09	1.11	41.4	+1.4	77	50.0	13	32.7	34	3	28.6	67.4	3.65	+0.58	7,449	nw.	44	w.	29	7	12	12	18.5	7.5	0	7.24	1884	1.53	1885			
Cape Henry	68	29.97	30.09	1.11	49.4	+4.4	80	53.4	20	35.7	32	6	39.8	63.5	3.16	+0.81	5,023	s.	26	nw.	15	9	12	10	11.5	9.4	9	10.72	1880	1.75	1886			
Lynchburg	638	29.37	30.09	1.11	44.6	+0.4	85	53.4	22	39.7	27	7	37.2	70.4	2.37	+0.37	9,858	sw.	48	sw.	28	6	15	10	11.6	0.4	1	9.13	1884	1.21	1876			
Norfolk	43	30.05	30.09	1.04	49.4	+0.3	76	59.6	19	39.5	36	7	35.6	67.3	3.08	+2.16	5,554	s.	28	w.	28	14	9	8	11.6	2.4	3	9.57	1880	1.62	1889			
S. Atlantic States.																																		
Charlotte	808	29.25	30.11	0.84	49.6	+0.4	76	59.6	19	39.5	36	7	35.6	67.3	3.08	+2.16	5,554	s.	28	w.	28	14	9	8	11.6	2.4	3	9.57	1880	1.62	1889			
Hatteras	11	30.10	30.12	0.87	52.6	+3.6	72	58.5	26	46.6	26	6	45.6	78.8	3.06	+3.68	14,136	s.	54	n.	10	15	6	8	4.4	5.4	1	12.77	1879	3.04	1887			
Raleigh	375	29.70	30.10	0.91	49.6	.....	79	59.8	20	39.5	30	5	35.6	66.4	3.74	.....	6,914	sw.	41	sw.	28	9	8	14	17.5	8.4	7	6.88	1888	2.72	1889	
Southport	52	30.05	30.12	0.76	53.2	+0.2	77	61.5	22	44.8	28	5	45.2	78.8	1.50	+2.74	7,333	sw.	36	sw.	22	10	11	10	11.5	0.3	5	7.09	1882	1.48	1887			
Wilmington	52	30.05	30.12	0.76	53.2	+0.2	77	61.5	22	44.8	28	5	45.2	78.8	1.50	+2.74	7,333	sw.	36	sw.	22	10	11	10	11.5	0.3	5	7.09	1882	1.48	1887			
Charleston	52	30.08	30.13	0.62	50.4	+0.6	82	63.9	25	48.8	25	6	48.6	81.6	1.72	+2.22	6,106	sw.	36	sw.	22	10	6	15	11.5	1.3	6	7.09	1882	1.48	1887			
Columbia	183	29.96	30.16	0.74	55.2	+0.8	84	66.3	23	44.1	30	6	39.8	65.6	3.05	+2.40	3,847	w.	30	sw.	28	10	13	8	10.5	5.3	6	6.20	1888	2.44	1889			
Augusta	87	30.06	30.15	0.57	50.6	+2.4	81	66.0	26	47.3	33	11	45.5	75.4	2.75	+0.97	6,409	sw.	34	nw.	16	10	12	9	13.4	2.2	7	10.18	1872	0.76	1887			
Savannah	43	30.11	30.16	0.50	60.2	+2.8	85	70.2	27	50.2	35	9	48.6	74.4	1.66	+0.66	6,284	se.	37	sw.	22	15	12	4	10.3	1.2	0	7.32	1872	0.89	1882			
Florida Peninsula.																																		
Cedar Keys	22	30.13	30.15	0.49	60.1	+2.9	76	66.6	30	53.6	26	6	53.0	82.0	1.14	+2.70	8,071	n.	42	n.	2	16	13	3	5.3	2.2	1	13.14	1886	0.94	1888			
Jupiter	28	30.10	30.13	0.39	67.8	.....	86	76.1	33	59.5	31	7	58.6	74.3	2.44	.....	8,183	se.	30	s.	22	10	9	12	8.4	3.5	3	2.44	1890	1.25	1888	
Key West	22	30.10	30.12	0.73	70.6	+2.4	82	75.4	48	65.8	19	6	64.2	80.5	2.17	+1.38	8,406	e.	48	nw.	2	16	13	2	7.4	0.2	1	6.89	1889	0.01	1882			
Mico	44	30.12	30.16	0.46	62.8	.....	88	72.1	32	53.5	39	7	56.8	84.3	3.84	.....	8,900	se.	40	n.	23	17	9	5	8.3	9.2	7	3.84	1890	0.02	1890	
Eastern Gulf States.																																		
Atlanta	1,139	28.92	30.13	0.66	49.6	+2.4	78	59.0	17	40.2	36	5	37.4	70.3	3.13	+3.72	7,368	nw.	39	w.	28	10	11	10	12.6	3.1	12	11.87	1880	1.99	1887			
Pensacola	50	30.07	30.13	0.61	58.8	+1.2	80	66.2	25	51.3	26	6	50.6	79.2	2.89	+2.77	8,809	nw.	40	sw.	22	11	11	9	14.4	8.3	0	13.37	1886	2.25	1887			
Auburn	35	30.10	30.14	0.68	57.1	+1.9	78	65.2	25	49.0	28	6	45.0	81.5	2.18	.....	7,874	nw.	35	sw.	22	8	14	9	14.4	5.2	4	14.62	1886	2.66	1890		
Mobile	35	30.10	30.14	0.68	57.1	+1.9	78	65.2	25	49.0	28	6	45.0	81.5	2.18	.....	7,874	nw.	35	sw.	22	8	14	9	14.4	5.2	4	14.62	1886	2.66	1890		
Montgomery	217	29.90	30.13	0.64	55.6	+1.4	84	65.2	21	46.0	37	7	43.5	70.8	3.93	+2.53	5,309	sw.	30	sw.	21	11	9	11	15.0	1.3	4	11.56	1875	0.72	1887			
Meridian	358	29.74	30.14	0.78	54.8	.....	82	63.9	19	44.5	36	6	42.0	70.5	4.32	.....	6,270	sw.	30	s.	27	9	15	7	9.5	9.4	7	14.51	1875	1.00	1879	
Vicksburg	222	29.85	30.09	0.84	56.8	+1.3	81	64.9	24	48.7	27	3	42.7	65.4	5.01	+1.40	6,538	se.	30	s.	27	9	15	7	9.5	9.4	7	14.51	1875	1.00	1879			
University	52	30.05	30.11	0.72	61.6	+0.4	80	69.8	30	53.9	29	7	51.0																					

Table of miscellaneous meteorological data for March, 1890—Signal Service observations—Continued.

Stations and districts.	Elevation above sea level, feet.	Pressure, in inches.			Temperature of air, in degrees Fahrenheit.										Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal precipitation.	Wind.										Cloudless days.	Partly cloudy days.	Cloudy days.	Days with rainfall.	Average cloudiness, tenths.	Precipitation data since opening of station.			
		Mean actual.	Mean reduced.	Monthly range.	Monthly mean.	Departure from normal.	Maximum.	Mean maximum.	Minimum.	Mean minimum.	Greatest daily range.	Least daily range.	Total movement, miles.	Prevailing direction.					Maximum velocity.			Length of record, years.	Greatest for month.	Year.	Least for month.	Year.											
																			Miles per hour.	Direction.	Date.																
<i>Kr. northwest-Conn.</i>																																					
Fort Buford.....	1,900	27.94	30.04	1.26	22.4	-0.6	31	32.1	-18	12.7	48	5	16.0	79.8	0.58	7,574	e. se.	60	nw.	24	3	18	10	8.6	5.6	1.17	1881	0.03	1884								
Fort Yates.....	2,500	28.01	30.11	1.10	25.5	+0.8	35	36.3	-16	15.4	44	9	15.4	79.8	0.30	7,574	e. se.	60	nw.	24	3	18	10	8.6	5.6	1.17	1881	0.03	1884								
<i>Upper Miss. Valley.</i>																																					
Saint Paul.....	831	29.17	30.11	1.08	22.4	-4.6	31	30.5	-16	14.3	32	4	13.8	74.4	1.11	5,789	w.	34	w.	25	10	12	9	13.5	1.4	3.25	1882	0.06	1883								
La Crosse.....	744	29.30	30.13	1.08	25.0	-4.0	30	34.3	-18	15.8	36	6	15.6	73.9	0.63	5,084	nw.	29	w.	25	9	15	7	10.4	5.4	4.23	1876	0.13	1883								
Davenport.....	613	29.43	30.12	1.19	30.0	-4.0	30	38.3	-8	21.6	29	4	19.8	71.0	2.34	5,211	nw.	36	e.	27	6	18	7	13.4	6.4	4.35	1876	0.17	1885								
Des Moines.....	869	29.15	30.11	1.09	29.7	-4.3	66	38.9	-8	20.5	33	9	19.8	71.6	0.61	5,533	nw.	36	ne.	27	19	5	7	12.4	8.4	3.09	1888	0.04	1885								
Dubuque.....	651	29.39	30.13	1.06	27.9	-4.1	59	36.6	-12	19.2	30	3	21.2	80.5	1.68	4,785	nw.	40	w.	25	9	12	10	13.4	1.5	4.53	1877	0.30	1889								
Keokuk.....	613	29.45	30.14	1.35	32.6	-4.4	67	41.6	-6	23.6	31	5	23.8	75.3	2.43	5,496	nw.	34	w.	25	11	12	8	12.4	7.4	3.78	1878	0.17	1885								
Cairo.....	339	29.72	30.11	1.23	42.9	-4.1	74	49.5	11	30.3	31	3	30.8	66.2	6.14	8,191	n.	58	w.	37	10	6	15	12.5	5.5	9.84	1876	1.08	1885								
Springfield, Ill.....	644	29.40	30.11	1.35	34.2	-5.8	64	42.6	-2	25.9	26	4	26.3	70.8	2.20	7,306	nw.	36	e.	27	8	11	12	13.5	2.7	4.92	1882	0.17	1885								
Saint Louis.....	571	29.50	30.13	1.40	39.6	-2.8	69	47.4	6	23.7	32	6	26.3	65.6	5.99	9,236	nw.	60	w.	27	10	9	12	12.4	2.5	6.90	1876	0.40	1885								
<i>Missouri Valley.</i>																																					
Columbia.....	37.0	29.08	30.13	1.23	37.0	-2.8	70	49.1	-6	24.8	46	14	24.8	65.4	1.15	6,801	nw.	48	sw.	27	7	10	14	10.5	5.4	1.61	1889	1.15	1890								
Kansas City.....	947	29.08	30.13	1.33	37.3	-6.3	73	47.9	-3	26.7	32	6	24.8	65.4	1.15	6,801	n.	38	sw.	24	7	16	8	8.5	5.5	5.92	1889	1.68	1883								
Springfield, Mo.....	1,336	28.61	30.08	1.14	42.6	-3.5	75	53.0	0	31.7	37	3	29.4	70.8	4.23	9,446	n.	60	nw.	27	7	14	10	8.4	7.5	5.92	1889	1.68	1883								
Leavenworth.....	842	29.21	30.13	1.35	37.5	-3.5	76	47.5	0	27.5	33	5	27.0	74.4	1.09	4,838	n.	30	nw.	27	7	8	16	8.5	5.5	5.78	1870	0.31	1885								
Topeka.....	1,113	28.91	30.14	1.25	37.8	-2.4	65	50.7	1	24.9	40	10	21.6	71.4	1.35	7,787	n.	44	nw.	27	6	18	7	7.7	7.7	3.21	1888	0.35	1890								
Omaha.....	1,113	28.91	30.14	1.25	37.8	-2.4	65	50.7	1	24.9	40	10	21.6	71.4	1.35	7,787	n.	44	nw.	27	6	18	7	7.7	7.7	3.21	1888	0.35	1890								
Crete.....	2,613	27.28	30.10	0.95	33.2	-6.0	69	42.2	-3	22.3	39	3	21.0	67.3	2.28	9,381	nw.	50	nw.	25	7	12	12	11.6	6.4	3.28	1888	1.33	1890								
Valentine.....	1,158	28.53	30.14	1.18	38.4	-5.8	68	46.2	-7	20.1	37	5	18.6	68.5	3.12	7,819	nw.	42	se.	23	8	12	11	12.5	7.3	5.4	1887	0.23	1887								
Sioux City.....	1,600	28.32	30.08	1.13	29.2	-6.9	39	39.3	-12	19.2	42	10	15.0	69.2	0.28	8,309	se.	46	nw.	25	8	18	5	9.5	6.5	1.52	1877	T.	1887								
Fort Sully.....	1,307	28.05	30.10	1.14	25.0	-3.0	50	34.6	-15	15.4	32	9	18.4	71.6	0.32	8,199	nw.	45	nw.	25	5	16	10	11.4	6.4	1.52	1884	0.12	1885								
Huron.....	1,232	28.74	30.10	1.15	25.6	-2.4	56	37.4	-7	19.7	35	3	18.5	71.8	1.07	8,014	nw.	48	nw.	25	7	10	14	9.6	5.5	3.38	1886	0.05	1882								
Yankton.....	1,232	28.74	30.10	1.15	25.6	-2.4	56	37.4	-7	19.7	35	3	18.5	71.8	1.07	8,014	nw.	48	nw.	25	7	10	14	9.6	5.5	3.38	1886	0.05	1882								
<i>Northern Slope.</i>																																					
Pt. Assiniboine.....	2,690	27.08	29.98	1.16	27.6	-2.4	52	36.6	-7	18.5	39	5	18.6	74.6	0.11	7,534	ne.	48	nw.	27	7	10	14	5.6	8.7	1.61	1883	0.07	1887								
Fort Custer.....	3,040	26.76	29.97	1.04	35.4	+1.4	65	45.2	-4	25.6	42	2	21.3	84.4	1.18	6,232	se.	47	nw.	21	5	14	12	10.6	9.8	1.1	1887	0.07	1882								
Fort Maginnis.....	4,340	25.73	29.96	0.93	31.6	+1.6	52	41.4	-4	22.2	34	6	21.3	81.1	0.95	5,691	n.	36	nw.	13	11	16	4	8.5	14.8	3.21	1888	0.05	1884								
Helena.....	4,099	25.73	29.96	0.93	31.6	+1.6	52	41.4	-4	22.2	34	6	21.3	81.1	0.95	5,691	n.	36	nw.	13	11	16	4	8.5	14.8	3.21	1888	0.05	1884								
Rapid City.....	3,280	25.57	29.95	0.93	33.4	-4.4	68	44.1	-3	22.8	39	6	21.4	83.3	1.40	6,882	n.	42	nw.	24	0	20	11	18.6	1.6	1.76	1888	0.07	1882								
Cheyenne.....	6,105	23.92	29.99	0.74	35.0	+1.0	62	44.9	-2	25.2	40	5	9.4	41.9	0.17	11,144	nw.	42	nw.	24	0	20	11	18.6	1.6	1.76	1888	0.07	1882								
Fort McKinney.....	5,000	24.84	29.98	0.90	35.5	-6.8	65	45.7	-6	25.6	33	7	23.7	78.6	0.86	5,899	nw.	58	sw.	9	7	11	13	11.5	6.5	1.02	1888	0.13	1889								
Fort Washakie.....	5,980	24.36	30.00	0.78	34.2	-6.0	60	47.7	-4	25.8	40	4	15.8	53.6	0.74	6,227	sw.	40	w.	21	18	8	5	3.3	9.4	1.02	1888	0.06	1889								
North Platte.....	3,841	27.07	30.08	0.89	35.4	+0.4	73	49.5	-4	23.4	51	8	20.5	62.0	0.27	8,313	nw.	42	nw.	24	9	13	7	5.5	1.5	1.82	1884	0.04	1882								
<i>Middle Slope.</i>																																					
Colorado Springs.....	5,281	24.68	29.98	0.86	41.0	+2.0	71	53.8	-3	24.3	43	8	18.6	54.9	0.39	6,066	*	36	n.	27	6	10	9	3.3	9.4	1.12	1875	0.12	1889								
Denver.....	4,733	23.18	30.04	0.92	43.4	-0.8	76	55.8	-1	26.0	49	9	9.1	36.8	0.48	6,991	e.	60	w.	20	8	15	9	4.4	4.7	0.51	1889	0.48	1890								
Pueblo.....	1,410	28.57	30.12	1.52	38.0	-7.0	70	49.9	-9	26.0	49	9	9.1	36.8	0.48	6,991	e.	60	w.	20	8	15	9	4.4	4.7	0.51	1889	0.48	1890								
Concordia.....	2,533	27.37	30.05	1.04	43.5	+0.5	77	56.7	11	31.3	48	8	23.8	57.2	0.05	9,209	ne.	62	n.	27	10	13	8	5.4	8.4	3.59	1876	0.04	1880								
Dodge City.....	1,356	28.37	30.07	1.44	43.6	-0.7	79	56.2	5	31.0	44	6	25.2	59.2	0.14	8,461	ne.	54	nw.	27	11	11	9	5.5	2.5	3.41	1889	0.14	1890								
Wichita.....	1,356	28.37	30.07	1.44	43.6	-0.7	79	56.2	5	31.0	44	6	25.2	59.2	0.14	8,461	ne.	54	nw.	27	11	11	9	5.5	2.5	3.41	1889	0.14	1890								
Fort Reno.....	1,356	28.37	30.07	1.44	43.6	-0.7	79	56.2	5	31.0	44	6	25.2	59.2	0.14	8,461	ne.	54	nw.	27	11	11	9	5.5	2.5	3.41	1889	0.14	1890								
Fort Supply.....	2,690	27.23	30.05	0.92	48.2	+2.2	84	63.0	15	33.5	48	7	25.6	54.7	0.02	10,655	n.	66	nw.	27	11	9	11	5.7	4.6	1.86	1885	T.	1881								

Chart I. Tracks of Areas



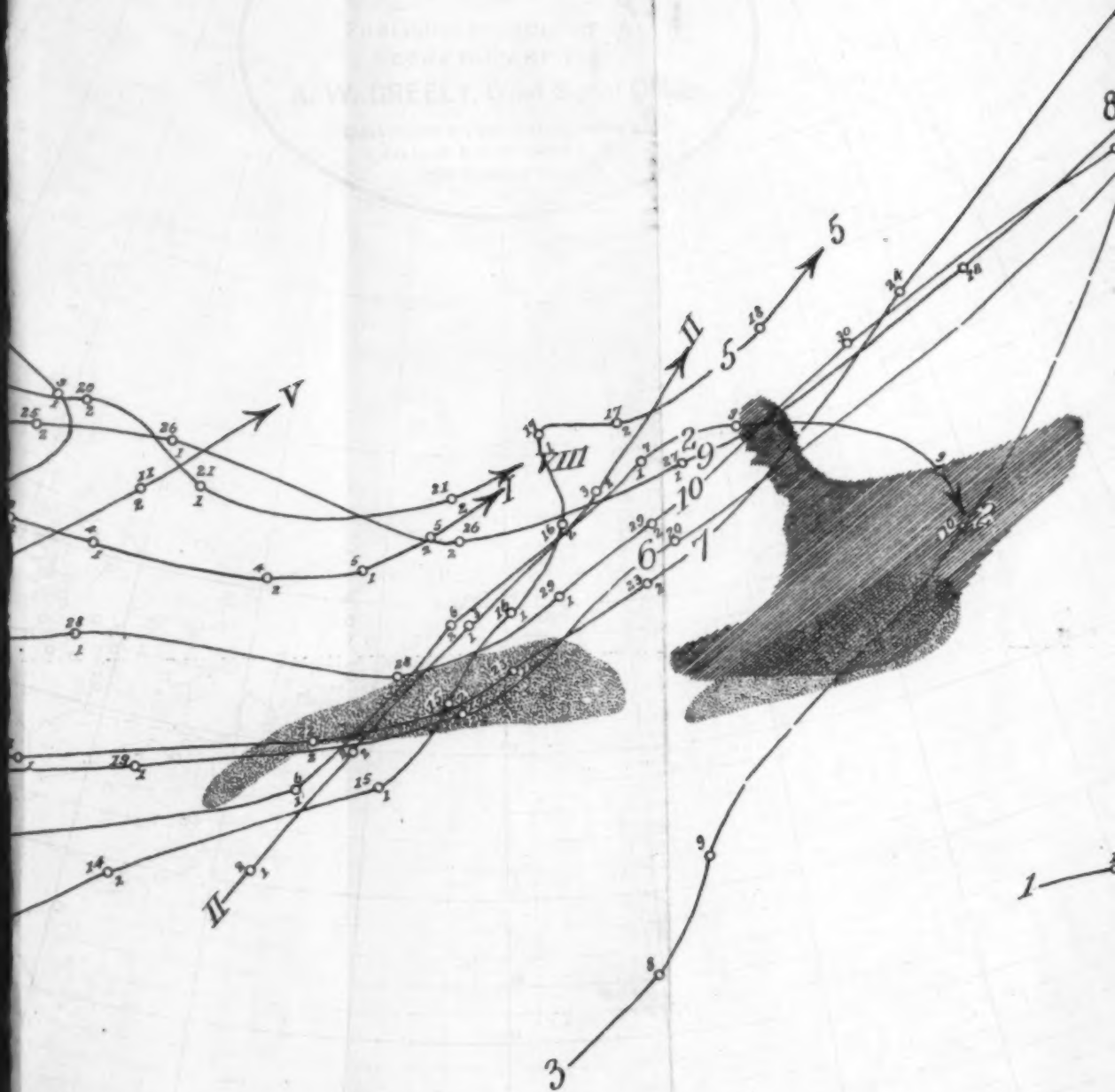
NOTES.

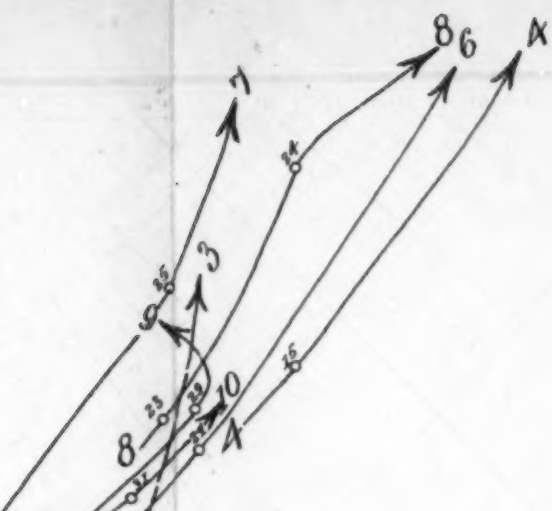
The Roman letters show number and order of areas of low pressure. The figures above the lines show the days of the month, those below (1 and 2) indicate, respectively, the 8 a. m. and 8 p. m., 75th meridian time, observations.

The dotted shading () indicates fog belts.

The ruled shading () indicates the position in which field-ice or icebergs were observed.

Chart I. Tracks of Areas of Low Pressure. March, 1890.





Storm Track.
 Isotherms.
 Isotherms.
 Isotherms.

For a full description of the
 system of symbols used in
 the charts, see the
 instructions on the back of the
 chart.

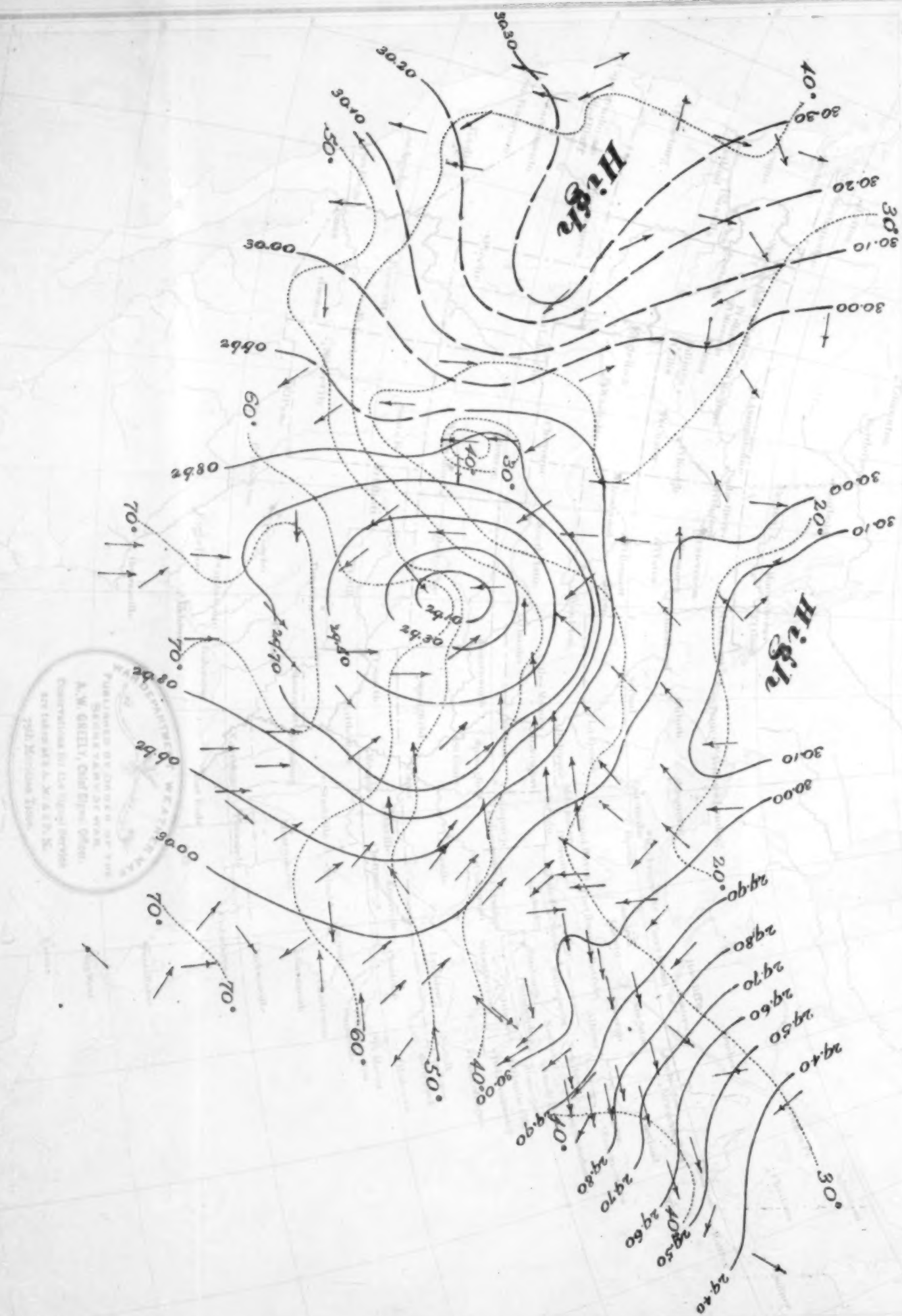


Chart II. Isobars, Isotherms, and Winds, March, 1890.

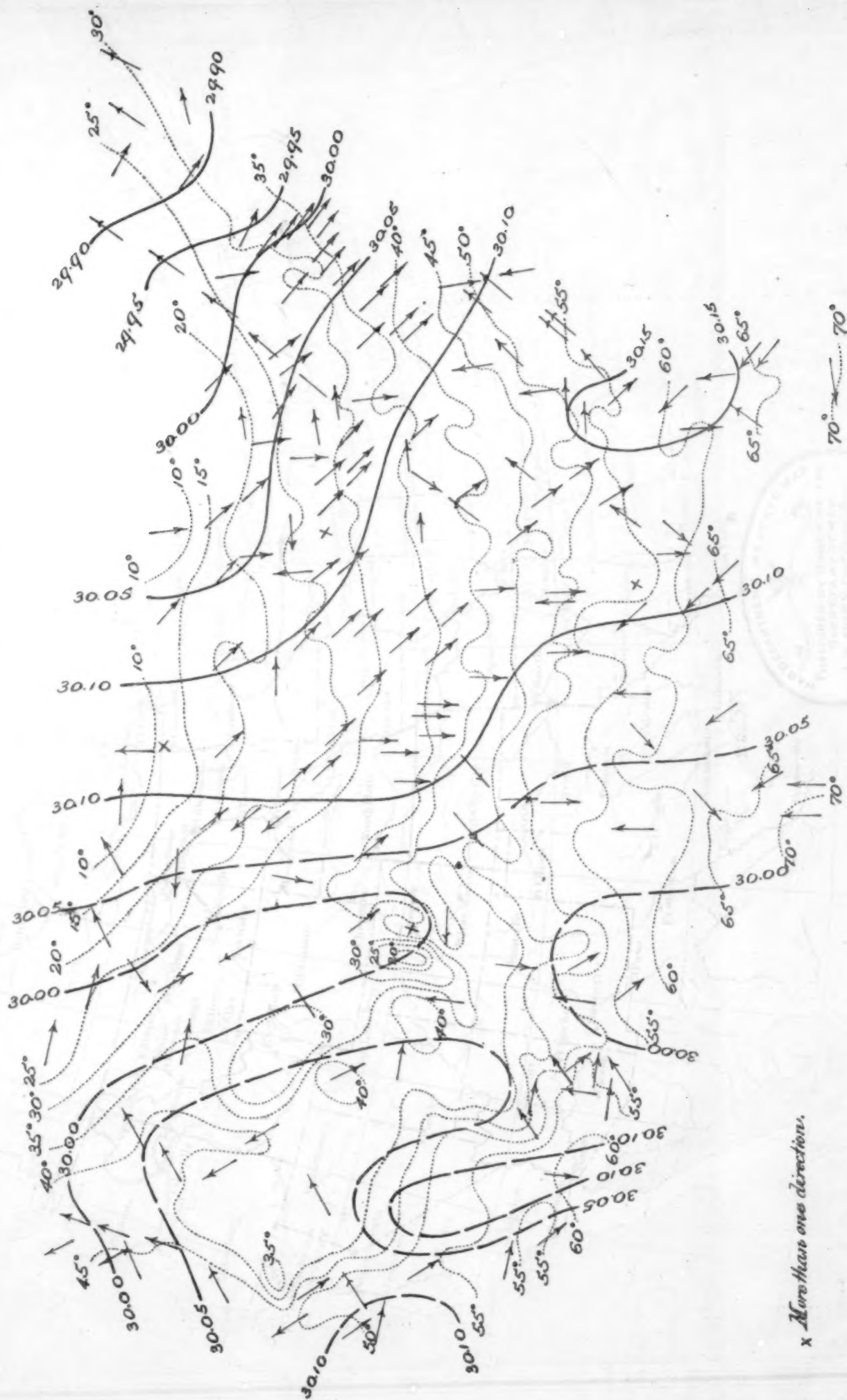
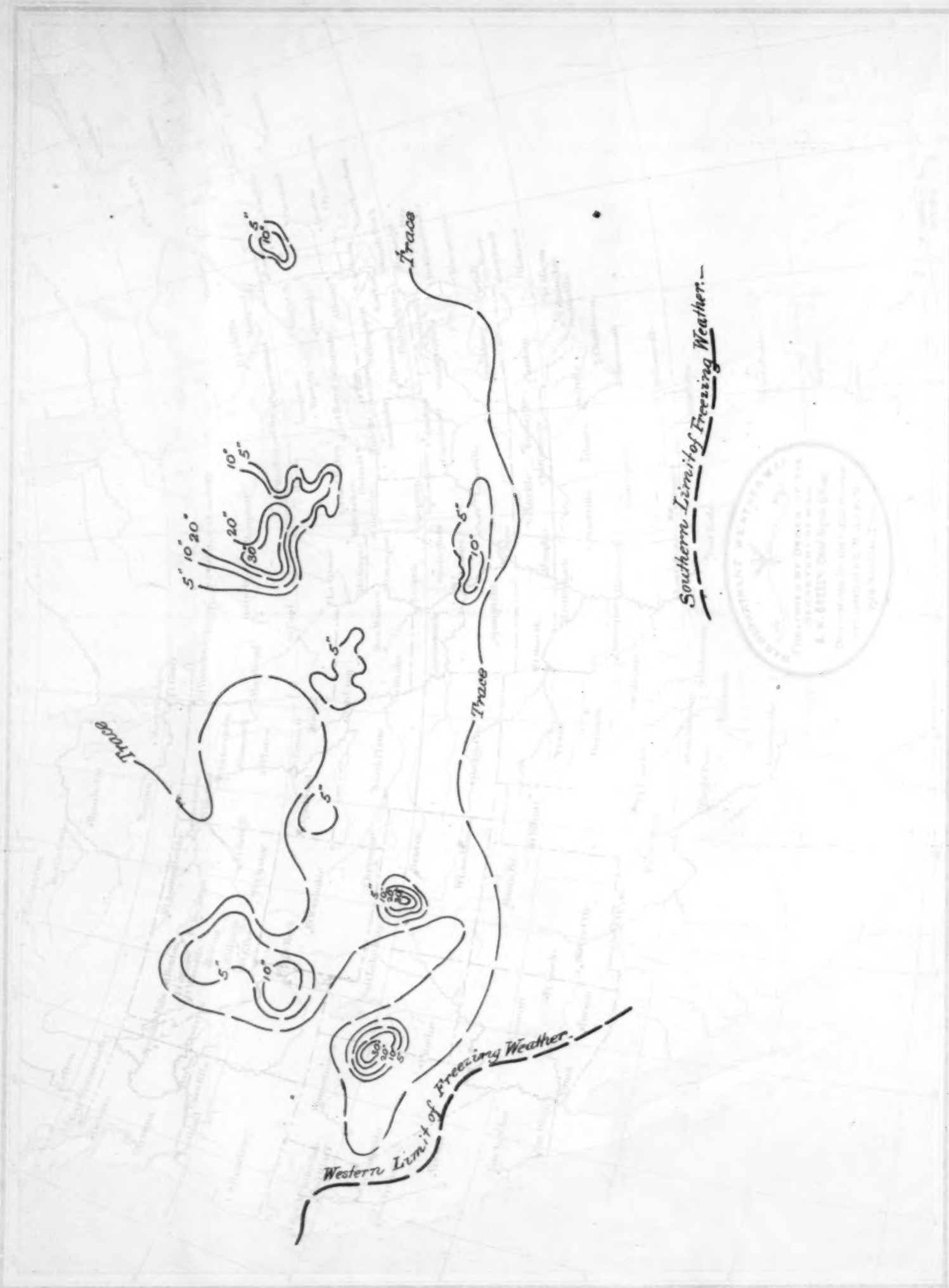


Chart III Precipitation. March, 1890.



Chart IV. Depth of Snow (inches) reported on ground March 31, 1890, and Limits of Freezing Weather.



List of voluntary observers of the Signal Service, who furnish meteorological reports for the Monthly Weather Review.

<p>Alabama. E E Elam Anniston Ala Prof P H Mell Auburn Ala Wm Fowler Bermuda Ala B F Gilder Butler Ala M L Stansel Carrollton Ala J G Michael Citronelle Ala W D Lovett Columbiana Ala J M Vickray Decatur Ala A M Weiler Double Springs Ala D J Moore Elkmont Ala Chas G Harrison Eufaula Ala W H Hawkins Evergreen Ala Prof C W Ashcroft Florence Ala D Collier Fayette Ala D P Goodhue Gadsden Ala M H Yerby Greensborough Ala H Lamar Jasper Ala J W A Wright Livingston Ala W J Fundabunk Luverne Ala Wm Garrett Mount Willing Ala Post Surgeon (Mt Vernon Barracks) Mount Vernon Ala J F Cooper Pine Apple, Ala L B Thornton Tuscumbia Ala R J Grady Union Springs Ala W H Newman Uniontown Ala Dr E P Nicholson Valley Head Ala M D Jones Wiggins Ala Arizona. Mrs J H Hamilton Antelope Valley Ariz J H Hudson Agua Fria Ariz J D Kinnear Benson Ariz Geo Banghart Chino Ariz Rev J G Pritchard Bisbee Ariz B W E Hurley Buckeye Ariz C E Cooley (Cooleys Sp'gs) Fort Apache Ariz D D Ross (Chiracahua Mt) Tombstone Ariz T C Bain Dos Cabezas Ariz J W Graham Dragoon Ariz Dr R B Tripp (Eagle Pass) Fort Thomas Ariz Post Surgeon Fort Apache Ariz Post Surgeon Fort Bowie Ariz Post Surgeon Fort Grant Ariz Post Surgeon Fort Huachuca Ariz</p>	<p>Post Surgeon Fort Lowell Tucson Ariz Post Surgeon Fort McDowell Ariz Post Surgeon Fort Mojave Ariz Post Surgeon Fort Verde Ariz M J Riordan Flagstaff Ariz A T Colton Florence Ariz D Murphy Gila Bend Ariz E W Perkins Fairbank Ariz D Rope Holbrook Ariz Mrs Alice F Cameron Lochiel Ariz J W Stump (Mt Huachuca) Tombstone Ariz S H Campbell Phoenix Ariz A B Shearer Phoenix Ariz Post Surgeon Whipple Barracks Prescott Ariz D D Gowan care F H Nash Strawberry Ariz W Sachse (Sachse's Ranch) Wilcox Ariz G M Adams Show Low Ariz H Koshland Signal Ariz Post Surgeon San Carlos Ariz L P Nash Strawberry Ariz Miss Mary Tevis Teviston Ariz F E Wager Tip Top Ariz S C Bagg Tombstone Ariz E L Wetmore Tucson Ariz W J Hill (Volunteer Sp'gs) Belmont Ariz T B Carter Walnut Grove Ariz F W Heyne (Walnut Ranch) Powers Ariz C P Smith Wilgus Ariz J T Ryan Williams Ariz F A Chamberlain (Willow Springs) Oracle Ariz Frank McDermott Winslow Ariz Arkansas. J Mays Benton Ark R B Smith Camden Ark A P Robinson Conway Ark T M Carder Dallas Ark B. J. Wilson Devalls Bluff Ark W B Johnson El Dorado Ark J H Bard Forrest City Ark T C Miller Huntington Ark S B Morris Heber Ark Post Surgeon U S A Hot Springs Ark</p>	<p>Chas Keenan Hot Springs Ark Prof R L Gowan Harrisburgh Ark W H Pyburn Lonoke Ark Post Surgeon Little Rock Barracks Little Rock Ark M F Locke Com of Agriculture Little Rock Ark Sgt W U Simons Little Rock Ark J L Adams Malvern Ark E B Windes Monticello Ark Alex Goodrich Osceola Ark Geo Bradley Ozone Ark Nettie Hollibaugh Pine Bluff Ark Dr E L Buerkle Stuttgart Ark M J Nash Texarkana Ark A H Carrigan Washington Ark A Dunlap Winslow Ark California. Dr A Fouch Anderson Cal H L Fry Arcata Cal Post Surgeon Alcatraz Island Cal Post Surgeon (Angel Island) San Francisco Cal Post Surgeon (Benicia Barracks) Benicia Cal Geo R Gooding Barstow Cal Prof F Soule Berkeley Cal Wm Barry (Centreville) Niles Cal Seward Cole Colegrove Cal D S Sartwell Crescent City Cal S Holland Evergreen Cal J H Frost Ferndale Cal Post Surgeon Fort Bidwell Cal Post Surgeon Fort Gaston Hoopa Valley Cal Post Surgeon Fort Mason San Francisco Cal C M Fitzgerald Georgetown Cal B F Berriman Grass Valley Cal E T Foss Hydesville Cal C F Macey Iowa City Cal L N Bailey Julian Cal T T Tidball Jolon Cal Jos Dominica La Grange Cal A Widmann Los Banos Cal F H McCullagh Los Gatos Cal L A Morgan Mendocino City Cal</p>	<p>J Berkely Needles Cal Prof A J Burnham Lick Observatory San Jose Cal Director Chabot Obs'y Oakland Cal Dr J B Trembly Oakland Cal H S Channing Pasadena Cal W G Williams (Loomis) Pin al R Rowland Placerville Cal W E Keith Riverside Cal S H Gerrish 1517 G street Sacramento Cal Dr E K Abbott Salinas Cal Post Surgeon Presido of San Fran San Francisco Cal Hugh D Vale Santa Barbara Cal Post Surgeon San Diego Barracks San Diego Cal H Block Santa Clara Cal L E Blochman Santa Maria Cal Robert Hall Sonoma Cal A T Mason (Steeles) Edna Cal R B Reedy Stockton Cal T B Sanders Susanville Cal J E Boal (Sweetwater Dam) National City Cal John Tuohy Visalia Cal W H Roscoe Upper Mattole Cal G O Colburn Vacaville Cal J Titcomb (Walla Walla Creek) Fort Jones Cal A L Bancroft Walnut Creek Cal Wm Lumbard Wheatland Cal David Bentley Willow Cal Colorado. C W Thiele Aspen Colo C A Montrose Alma Colo R G Taylor Amherst Colo Mrs J Rogers Apishapa Colo L Powell Agate Colo W L Doyle Aroya Colo Dr B A Arbogast Breckenridge Colo Agent U P R R Byers Colo Mrs M A Leavett Brush Colo G E Lake Boulder Colo W Holcomb Castle Rock Colo E Havemeyer Cortez Colo W B Felton Canon City Colo</p>	<p>G C Wortman Climax Colo Prof F H Loud Colorado Springs Colo Sgt W S Miller Colorado Springs Colo A Reicheneker Como Colo Agent U P R R First View via Cheyenne Wells Colo Miss Zaninette Delta Colo J A Curtis Delta Colo Agent U P R R Deer Trail Colo T J Jackson Durango Colo Rev Wm Forstall Jesuit College Denver Colo C H Mather Emma Colo A W Wing (Eagle Farm) Pueblo Colo Prof L G Carpenter Fort Collins Colo Post Surgeon Fort Crawford Uncompahgre Colo Post Surgeon Fort Lewis Colo Post Surgeon Fort Logan Colo J M Lytle Fort Morgan Colo J H Berry Fruita Colo Dr T H Breen Fruita Colo L D C Gaskill Fraser Colo E Bethel Greeley Colo Dr W A Jayne Georgetown Colo D McCann Gunnison Colo E B Barnes Hardin Colo E P Moon Husted Colo Agent U P R R Hugo Colo W B Hawkins Idaho Springs Colo M H Woodman Julesburg Colo Agent U P R R Kit Carson Colo G T Herbert Lamar Colo J C Carroll Leadville Colo Dr E J Clark Longmont Colo W E Culver Las Animas Colo A E Sprague Moraine Colo Agent U P R R Magnolia Colo C J Aldrich Monte Vista Colo L S Kelly Parachute Colo Dr T Gaddis Palmer Lake Colo W L Wilder (Rifle Falls) New Castle Colo Agent U P R R River Bend Colo F Watrous Rocky Ford Colo J D Lucas Sedgwick Colo</p>
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List of voluntary observers of the Signal Service, etc.—Continued.

H N Griffin
(San Luis) Del Norte Colo
P Blumer
(Thon) Elizabeth Colo
L T Durbin
Villa Grove Colo
E A Rider
Whitewater Colo
Jos Irwin
Wigwam Colo
Agent U P R R
Watkins Colo
T Charlton
Westcliffe Colo

Connecticut.

H R Stevens
(Birmingham) Stevens Conn
G J Case
Canton Conn
J B Perry
Clark's Falls Conn
S P Willard
Colchester Conn
M H Dean
Falls Village Conn
Post Surgeon
Fort Trumbull
New London Conn
J Murtaugh
Hartford Conn
Rev S Hart
Hartford Conn
W R Matson
47 Garden st Hartford Conn
J H Tucker
Lebanon Conn
E A Bailey
Mansfield Conn
H D A Ward
Middletown Conn
S T Frost
Meriden Conn
H F Wells
New Britain, Conn
R R Smith
New Hartford Conn
Rev Wm Goodwin
New Hartford Conn
T B Wheeler
(Shelton) Birmingham Conn
K B Loomis
South Manchester Conn
L Andrews
Southington Conn
Miss E D Larned
Thompson Conn
W H Rathbone
Uncasville Conn
Rev E Dewhurst
Voluntown Conn
Mrs B F Harrison
Wallingford Conn
N J Welton
Waterbury Conn
S T Stockwell
West Simsbury Conn

Delaware.

Wm Carnagy
Kirkwood Del
District Columbia.
Deaf & Dumb College
Kendall Green Wash D C

Florida.

M E Bingham
Altamonte Springs Fla
C E Robins
Alva Fla
A F Wyman
Archer Fla
Post Surgeon
(Fort Barrancas)
Warrington Fla
A H Adams
Fort Meade Fla
J S Wade
Homeland Fla

H D Price
Hypoluxo Fla
Dr J Y Porter Sec'y
State Board of Health
Jacksonville Fla
Dr J C Neal
Lake City Fla
Miss C K Dupont
Matanzas Fla
Mrs Mary W Broberg
Manatee Fla
Rev J H White
(Merritts Id) Georgiana Fla
Livingston Vann
Madison Fla

F Wiehl
Ocala Fla
J M Bourland
Pine Level Fla
Post Surgeon
(St Francis Barracks)
St Augustine Fla
Paul R Gailmard
San Antonio Fla
Rev W H Carter
Tallahassee Fla
F S Parlow
Villa City Fla

Georgia.

W P Briggs
Athens Ga
H W Bryant
Andersonville Ga
Prof L H Charbonnier
Athens Ga
Frank M Hall
Camilla Ga
Wm Kimzey
(Diamond) Roy Ga
T G Scott
Forsyth Ga
Post Surgeon
Fort McPherson
Atlanta Ga
W H Howell Man Ed
Atlanta Constitution
Atlanta Ga
K L Rhodes
Hephzibah Ga
R E Walker
Jesup Ga
C W Meaders
Gillsville Ga
G W Warren
Louisville Ga
G S Owen
Marietta Ga
J S Cook
Milledgeville Ga
J R Sheppard
Millen Ga
G F Meriwether
Monticello Ga
C H Moore
Perry Ga
C M Witcher
Point Peter Ga
J L Cutler
Quitman Ga
C S Boudurant
Thomasville Ga
Hon A J Julian
Woolley's Ford Ga

Idaho.

Frank Campbell
American Falls Idaho
A C Bomar
Bonanza City Idaho
Post Surgeon
Boise Barracks
Boise City Idaho
Hervey Brooks
Era Idaho
Post Surgeon
Fort Sherman
Sherman Idaho

D McLoughlin
Kootenai Idaho
R Schleicher
Lewiston Idaho
G M Wilson
Mullan Idaho
Dr F B Delano
Payette Idaho
L C Eastman
Soda Springs Idaho
Illinois.
J W C Gray
Atwood Ill
Dr M M Robbins
Aurora Ill
W Holden
Aurora Ill
L H Sullivan
Beason Ill
E L Lawrence
Belvidere Ill
J L Hallam
Centralia Ill
J L Jaeger
Cockrell Ill
Dr J L R Wadsworth
Collinsville Ill
H D Fisk
Dwight Ill
C L Farrington
East Peoria Ill
Post Surgeon
Fort Sheridan
Highwood Ill

L A Michels
Flora Ill
J E Y Hanna
Golconda Ill
Prof M S Oudyn
Greenville Ill
C H Oakford
Griggsville Ill
W C Ball
Gibson City Ill
A T Purviance
Hennepin Ill
Wm Rogan
(Irishtown) Carlyle Ill
W J S Cathcart
(Jordan's Grove)
Marissa Ill
Rev A C Price
Lacon Ill
E E Jenkins
Louisville Ill
L R F Griffin
Lake Forest Ill
C H Beeler
Lanark Ill
J B Sheapley
Martinsville Ill
Dr G Leibrock
Mascoutah Ill
W P Gibbs
McLeansborough Ill
C H Fahs
Olney Ill
V E Phillips
Olney Ill
T A Wetmore
Oneida Ill
J S Seeley
Oswego Ill
Dr J O Harris
Ottawa Ill
J E Templeton
Palestine Ill
J K Eberle
Pana Ill
Dr F Brendel
Peoria Ill
H A Burr
Philo Ill
Isaac Young
Pontiac Ill
C H Oakford
Quincy Ill

T D Robertson
Rockford Ill
N T Veatch
Rushville Ill
Post Surgeon
Rock Island Arsenal
Rock Island Ill
J W James (Riley)
Marengo Ill
Dr M D Ewell (S Evanston)
Room 52 97 Clark St
Chicago Ill
Sgt John Craig
Springfield Ill
R Dow
Sycamore Ill
H Upsall
Watseka Ill
P J Bates
White Hall Ill
F Osborne
Winnebago Ill
G D Silliman
Woodstock Ill
Indiana.
L Stealy
Angola Ind
C F Hole
Butler Ind
Dr N I Kithcart
Columbia City Ind
J A Perry
Columbus Ind
R Hessler
Connersville Ind
T E Huston
Cannelton Ind
J E Wright
Dana Ind
J P White
De Gonia Springs Ind
Higginbotham & Son
Delphi Ind
D A Owens
Franklin Ind
W J Davidson
Farmland Ind
C R Kluger
Huntingburgh Ind
Sgt C F R Wappenhans
Indianapolis Ind
J C Loomis
Jeffersonville Ind
Lafe Crozier
Laconia Ind
Prof H A Huston
La Fayette Ind
D E Prior
Logansport Ind
J M Johnson
Marengo Ind
E Kirkwood
Mauzy Ind
J M Lockwood
Mount Vernon Ind
S R Frankboner
Marion Ind
Stephen & Durham
Muncie Ind
Prof E S Hallett
New Providence Ind
E Jones
Princeton Ind
J F Hood
Point Isabel Ind
E J Mote
Richmond Ind
A C Bates
Rockville Ind
Dr E B Vincent
Sunman Ind
Wm Dawson
Spiceland Ind
J A Forsythe
Seymour Ind
S B Morris
Shelbyville Ind

Prof J N Roe
Valparaiso Ind
Prof C G Boerner
Vevay Ind
Dr. W B Squire
Worthington Ind

Indian Territory.

Post Surgeon
Fort Gibson Ind T
Post Surgeon
Fort Reno Ind T
Post Surgeon
Fort Sill Ind T
Post Surgeon
Fort Supply Ind T
Morris Collar
Guthrie Ind T
Dr R Leming
Healdton Ind T
G H Heald
Healdton Ind T

Iowa.

J W Love
Atlantic Iowa
Conrad Schadt
Amana Iowa
J Rush Lincoln
Ames Iowa
H N Renfrew
Bancroft Iowa
H W Van Dike
Belle Plaine Iowa
James Rogers
Blakeville Iowa
Moses Simon
Carroll Iowa
G N Ferguson
Carson Iowa
H D Olds
Cedar Rapids Iowa
A S Van Sandt
Clarinda Iowa
Luke Roberts
Clinton Iowa
Gregory Marshall
Cresco Iowa
Sgt George M Chappell
Des Moines Iowa
Adolphus Voegeli
(Box 123) Des Moines Iowa
Joseph Dysart
Dysart Iowa
C A Schaffter
Eagle Grove Iowa
J N Hamilton
Elkader Iowa
R Z Latimer
Fayette Iowa
Miss L A McCready
Fort Madison Iowa
Seth Dean
Glenwood Iowa
Prof S J Buck
Grinnell Iowa
E C Grenelle
Hampton Iowa
Miss Florence Prouty
Humboldt Iowa
Emil F. Wulfke
Independence Iowa
J L Tilton
Indianola Iowa
Prof A A Veblen
Iowa City Iowa
W J Wicks
Irwin Iowa
Mrs M B Stern
Logan Iowa
H B Strever
Larrabee Iowa
W L Thompson
Manson Iowa
Dr A B Bowers
Maquoketa Iowa
H D Smith
Monticello Iowa

List of voluntary observers of the Signal Service, etc.—Continued.

Dr Max E Witte
Mt Pleasant Iowa
Prof Alonzo Collins
Mt Vernon Iowa
J P Walton
Muscatine Iowa
Miss Ruby P Barr
McCausland Iowa
G D Pattingill
Osage Iowa
Jos Boyd
Oskaloosa Iowa
Dr Caleb Brown
Sac City Iowa
A J Bond
Storm Lake Iowa
T. F. McCune
Vinton Iowa
W A Cook
Washington Iowa
Wm Ward
Wesley Iowa
C M Trumbauer
Webster City Iowa
P Dorweiler
West Bend Iowa
Kansas.
J J Cass
Allison Kans
F E Ellis
Augusta Kans
B P Hanan
Arlington Kans
W P Gulick
Abilene Kans
H E Faidley
Burr Oak Kans
Agent U P R R
Buffalo Park Kans
A B Greaves
Belleville Kans
Agent U P R R
Brookville Kans
C S Culver
Bucklin Kans
Agent U P R R
Bunker Hill Kans
Gus Campbell
Bendena Kans
G Olivant
Conway Kans
H A Williams
Concordia Kans
A G Alrich
Cawker City Kans
Agent U P R R
Carneiro Kans
E Shaw
Cunningham Kans
Agent U P R R
Collyer Kans
C C Humphrey
Cairo Kans
Agent U P R R
Dorrance Kans
J B Handy
Downs Kans
Dr A C Williams
Elk Falls Kans
Prof T H Dinsmore Jr
Emporia Kans
C D Perry
Englewood Kans
F L Williams
Ellis Kans
Agent U P R R
Ellis Kans
Agent U P R R
Ellsworth Kans
Ed Atkin
Fremont Kans
Post Surgeon
Fort Hays Kans
Post Surgeon
Fort Leavenworth Kans
Post Surgeon
Fort Riley Kans

Post Surgeon
Military Prison
Fort Leavenworth Kans
Jesse Royer
Gove Kans
Agent U P R R
Gorham Kans
Agent U P R R
Grinnell Kans
Agent U P R R
Grainfield Kans
J H Starke
Green Ridge Kans
R M Lawyer
Grenola Kans
Wm Featherstone
Globe Kans
L W Dennen
Havensville Kans
D C Ruth
Halstead Kans
W S Belden
Horton Kans
Agent U P R R
Hays City Kans
O F Ellithorpe
Hoxie Kans
J M Altaffer
Independence Kans
Prof R Hoy
Junction City Kans
E R Heath
Kansas City Kans
J D Humphrey
Kingman Kans
Jacob Nixon
Kellogg Kans
Agent U P R R
Kanopolis Kans
Isaac S Coe
La Harpe Kans
Prof F H Snow
Lawrence Kans
R A Rainey
Leoti Kans
F R French
Lakin Kans
W H Mead
Luray Kans
Wm Graves
Lincoln Kans
C B Jennings
Lebo Kans
H Woodcock
Lisbon Kans
C P Blachley
Manhattan Kans
C M Breese Ag'l College
Manhattan Kans
R P Edgington
Morse Kans
J L Steel
Minneapolis Kans
A C Abbott
Marmaton Kans
J H Starke
Macksville Kans
C E Poling
Macksville Kans
F T Dunkle
McPherson Kans
Agent U P R R
Monument Kans
Agent U P R R
McAllaster Kans
E H Kern
Mankato Kans
G F Tassell
Offerle Kans
Agent U P R R
Ogallah Kans
Agent U P R R
Oakley Kans
D Doyle
Oswego Kans
W J Jackson
Quenemo Kans

Agent U P R R
Quinter Kans
G H Allen
Richfield Kans
D M Adams
Rome Kans
Agent U P R R
Russell Kans
J R Chapman
Salina Kans
J W Goodell
Sedan Kans
S P Kane
Scott City Kans
W H Harvey
Shields Kans
Agent U P R R
Sharon Springs Kans
Dr S S Kaysbier
Seneca Kans
C E Wightman
Tribune Kans
Prof J T Lovewell
Topeka Kans
Sgt T B Jennings
Topeka Kans
Washburn College
Topeka Kans
W B Cheney
Vesper Kans
Agent U P R R
Victoria Kans
Agent U P R R
Weskan Kans
W P Cochran
Wakefield Kans
Agent U P R R
Wilson Kans
Agent U P R R
Wa Keeney Kans
Agent U P R R
Walker Kans
Agent U P R R
Winona Kans
J H Wolfe
Wellington Kans
Kentucky.
M H Crump
Bowling Green Ky
H B Bonar
Caddo Ky
C H Major
Canton Ky
J B Atkinson
Earlington Ky
E C Went
Frankfort Ky
F W McGill
Franklin Ky
Dr F L Harrod
Harrodsburgh Ky
Dr E A Grant
Louisville Ky
Sgt Frank Burke
Louisville Ky
Rev C Pope
Millersburgh Ky
H C McKee
Mt Sterling Ky
J P Jones
Murray Ky
Post Surgeon
Newport Barracks
Newport Ky
J S Cox
Owenton Ky
Oscar Haynes
Pellville Ky
Wm Martindell
Princeton Ky
Prof O A Kennedy
Richmond Ky
H W Prissler
Shelbyville Ky
A B Gilbert
South Fork Ky

Louisiana.
Dr C J Edwards
Abbeville La
L C Giffe
Alexandria La
Miss Grace E Manard
Amite City La
Prof B B Ross
Baton Rouge La
H A Binning
Bayou Sara La
Dr L D Chauff
Bonnet Carre La
Prof F Greene
Convent La
W W Wall
Cheneyville La
J A White Jr
Clinton La
L M Howard
Coushatta La
A B Goodrich
Crowley La
Hon S P Henry
Cameron La
Dr J W McGinnis
Columbia La
W P Moore
Delhi La
Paul Leche
Donaldsonville La
L D Martin
Edgard La
W P Chandler
Farmerville La
Prof G Williamson
Grand Cane La
J P Gay
Girard La
Rev J A Raby S J
Grand Coteau La
H F Belanger
Houma La
W A Reed
Hammond La
G W Whitworth
Jeanerette La
W A Martin
Jonesville La
J J Davidson
La Fayette La
Dr Wm Meyer
Lake Charles La
Dr. E A Crawford
Liberty Hill La
M R Bein
Luling La
L J Dodge
Melville La
W S Hunter
Minden La
Alex Band
Mandeville La
W W Renwick
Monroe La
L Molenar
Marksville La
R Benefield
Maurepas La
Mrs J A Gebert
New Iberia La
Sgt R E Kerkam
New Orleans La
Post Surgeon
Jackson Barracks
New Orleans La
A M Gardiner
Andubon Park
New Orleans La
J E Le Blanc
Paincourtville La
P G Kleinpeter
Plaquemine La
Miss Mattie Laws
Port Eads La
E Dechamps Jr
Shell Beach La

Maj S T Grisamore
Thibodeaux La
L P Ault
Vidalia La
Maine.
Post Surgeon
Kennebec Arsenal
Augusta Me
Jos Wood
Bar Harbor Me
L H Murch
Belfast Me
Dr D E Seymour
Calais Me
Silas West
Cornish Me
H M Mansfield
Fairfield Me
J M S Hunter
Farmington Me
Henry Richards
Gardiner Me
Prof W C Strong
Kent's Hill Me
Union Water Power Co
Lewiston Me
V P Hall
Mayfield Me
Prof M C Fernald
Orono Me
Post Surgeon
Fort Preble Portland Me
G L Upton (Petit Manan)
Milbridge Me
C Hopkins
West Jonesport Me
Maryland.
Post Surgeon
Fort McHenry
Baltimore Md
A E Acworth
Barren Creek Springs Md
E T Shriver
Cumberland Md
H Shriver
Cumberland Md
Prof G G Curtis
Fallston Md
McClintock Young
Frederick Md
J T De Sellum
Gaithersburgh Md
Henry Parr
Galena Md
J E Moque
Gambrell's Md
Jos Plummer
Jewell Md
G W Joy
Leonardtown Md
McDonogh Institute
McDonogh Md
Mt St Mary College
Mt St Mary's Md
Woodstock College
Woodstock Md
Massachusetts.
A B Wiggins
Andover Mass
Miss S C Snell
Amherst Mass
Hatch Experiment Station
Amherst Mass
Ag'l Experiment Station
Amherst Mass
T K Lathrop Jr
Beverly Farms Mass
Post Surgeon
Fort Warren Boston Mass
Prof W H Niles
Boston Mass
Pvt J W Smith
Boston Mass
Rev A K Teele (Blue Hill)
Milton Mass
Prof A L Rotch (Blue Hill)
Readville Mass

List of voluntary observers of the Signal Service, etc.—Continued.

Dr F A Rogers Brewster Mass	Miss L W Chase Royalston Mass	E S Grierson Calumet Mich	W A Black Kalamazoo Mich	V W Eaton (Washington) Romeo Mich
Desmond Fitzgerald Brookline Mass	Mrs I D Page Randolph Mass	H J Webb Cassopolis Mich	Dr H B Baker Sec State Board of Health Lansing Mich	C S Woodward Ypsilanti Mich
Harvard College Observat'y Cambridge Mass	Elisha Slade Somerset Mass	C J Wells Chase Mich	Sgt N B Conger Lansing Mich	J C Bemiss Ypsilanti Mich
E C Brooks Cambridge Mass	J P Andrews Salem Mass	Jacob Walton Cheboygan Mich	A Lathrop Lathrop Mich	Minnesota.
Prof W M Davis Cambridge Mass	A A Smith Salem Mass	J H Van Riper Chelsea Mich	G A Whitbeck Montague Mich	John Ross Crookston Minn
F H Norton Chicopee Mass	H W Cushing South Hingham Mass	M Shotwell Concord Mich	L D Watkins Manchester Mich	D F Akin Farmington Minn
G W Weeks Clinton Mass	Post Surgeon National Armory Springfield Mass	G W Teller Colon Mich	J Randall Mio Mich	J Ellingsen Grand Rapids Minn
Gen J H Reid Cotuit Mass	Dr E U Jones Taunton Mass	G H Davis Columbiaville Mich	H C Bradish (Madison) Adrian Mich	L B Davis Le Sueur Minn
L M Hastings Cambridgeport Mass	A F Sprague Taunton Mass	W C Brown Crystal Falls Mich	N Cody May Mich	D R Stockey Mankato Minn
Jas Childs Deerfield Mass	Taunton Water Works Taunton Mass	E H Green Charlevoix Mich	Post Surgeon Ft Mackinac Mackinac Id Mich	Wm Cheney Minneapolis Minn
Conant Observatory Dudley Mass	J S Newcomb Westborough Mass	J A Hunt Crawford Mich	Dr G H Green Marshall Mich	D T Wheaton Morris Minn
C V S Remington Fall River Mass	J B Hall Worcester Mass	Jas White Caldwell Mich	J A Hartzler Mottville Mich	L G Moyer Montevideo Minn
P Kiernan Fall River Mass	Williams College Obs'y Williamstown Mass	Post Surgeon Fort Wayne Detroit Mich	E E Bushnell Noble Mich	G H Alden Northfield Minn
O B Truesdell Fiskdale Mass	Dr S W Abbott Wakefield Mass	Rev J E Terborg 156 Campbell Ave Detroit Mich	M Foote North Adams Mich	Wm Krueger Osseo Minn
Dr J Fisher Fitchburg Mass	Boston Mfg Co Waltham Mass	N D Yale Deerfield Mich	H Wilson North Aurelius Mich	C E Crane Owatonna Minn
Dr A P Mason Fitchburg Mass	Prof Sarah F Whiting Wellesley Mass	J W Chapin Eden Mich	P Mayo (North Marshall) Battle Creek Mich	Neil Johnson (Pine River) Brainerd Minn
Boston Water Works Framingham Mass	G S Newcomb Westborough Mass	S B Laird East Tawas Mich	Prof C S Richardson Olivet Mich	B C Finnegan (Pokegama Falls) Grand Rapids Minn
Dr W U Brown Gilbertville Mass	L R Symmes Winchester Mass	Mrs H A Hepburn Evart Mich	W H Faxon Ovid Mich	Prof O Whitman Red Wing Minn
R Wheatland Groton Mass	R Fobes Worcester Mass	L D Watkins Fairview Mich	C H Prentiss Otsego Mich	Capt F Wherland (Rolling Green) Fairmont Minn
C Woolley Groton Mass	Michigan.	M Conklin Fitchburgh Mich	L Morill Parkville Mich	H W Hill St Charles Minn
J W Doran Holyoke Mass	G W Grigsby Allegan Mich	C I Rathbun Fremont Mich	H M Warren Pontiac Mich	Cpl John Healy Saint Paul Minn
B B Cutler Heath Mass	P M Smith Alma Mich	W L Fisher Flint Mich	J W Hutchins Pulaski Mich	L Curry Sheldon Minn
Essex Company Lawrence Mass	W H Howard Adrian Mich	J W Morris Grape Mich	J C Gould Paw Paw Mich	Post Surgeon Fort Snelling Minn
A Kendrick Leicester Mass	H Obenhoff Atlantic Mine Mich	F W Ball Grand Rapids Mich	L R Brown Rawsonville Mich	Mississippi.
W B Hosmer Leominster Mass	Wm Boyd Albion Mich	O Palmer Grayling Mich	F D Lark Rogers City Mich	Prof J M White Agricultural College Miss
Prop Locks & Canals Lowell Mass	C E Barr Albion Mich	J H Scott Gaylord Mich	H M Heal Roscommon Mich	E W Bee Brookhaven Miss
F E Saunders Lowell Mass	Wm Atkins (Arbela) Millington Mich	Prof F C Smith Gladwin Mich	Prof O D Thompson Romeo Mich	J M Cox Batesville Miss
M W Graves Ludlow Mass	A L Colton Ann Arbor Mich	A Beebe (Gulliver Lake) Manistique Mich	A Cunningham South Albion Mich	A G Smith Booneville Miss
J Haviland Ludlow Mass	J R Graham Amadore Mich	F D Munson Howell Mich	O A Hunt St John's Mich	W B Hopkins Columbus Miss
J C Haskell Lynn Mass	F N Hilton (Ball Mt) Pontiac Mich	A T Travers Hartford Mich	W E Nims Sand Beach Mich	Miss H Quinche Columbus Miss
J H White Mansfield Mass	R O Gould Berville Mich	E B Rodgers Hillsdale Mich	Rev J Ferris St Ignace Mich	G W Smith Vaniz Canton Miss
R M Gow Medford Mass	D J McDiarmid Bear Lake Mich	L B Smith Hanover Mich	C H Force Stockbridge Mich	C W Barber Edwards Miss
Middleborough Water Wk's Middleborough Mass	F R Fowler Big Rapids Mich	E S Snow Harbor Springs Mich	R C Gardner Stanton Mich	J N Bedford Fayette Miss
Dr G E Fuller Monson Mass	C F Howe Buchanan Mich	F H Edwards Hart Mich	J J Decker Standish Mich	E R Somerville Greenville Miss
Wm Street Mount Tom Mass	David Strahly (Bronson) Burr Oak Mich	Dr W W Mitchell Harrisville Mich	Post Surgeon Ft Brady Sault de Ste Marie Mich	J H Cleveland Hattiesburgh Miss
Dr W D Hodges Nahant Mass	C W Cornwall Bell Branch Mich	Jas Francis Hillman Mich	Dr J S Caulkins Thornville Mich	Dr F B Shuford Holly Springs Miss
T R Rodman New Bedford Mass	W J Jones Berrien Springs Mich	Dr F R Timmerman Hastings Mich	Dr J D Munson Traverse City Mich	H T Bryant Holly Springs Miss
New Bedford Water Works New Bedford Mass	F A Zerby Berrien Springs Mich	T N Clark Harrison Mich	S E Wait Traverse City Mich	S Flanigan Jackson Miss
F V Pike Newburyport Mass	Dr H V Tutton Benton Harbor Mich	A D DeGarmo Highland Station Mich	M M McCormack Vienna Mich	L Heyman Kosciusko Miss
Newburyport Water Works Newburyport Mass	S Alexander Birmingham Mich	C F Leipprandt Hayes Mich	A Smith Vandalia Mich	W B Windsor Lake Miss
J M Clark Northampton Mass	H D Burrell Bangor Mich	R M Watkins Ionia Mich	W A Weeks West Branch Mich	A W Hull Lamar Miss
C H Kohlrausch North Billerica Mass	C T Hopkins Benzonia Mich	O L Giddings Ivan Mich	J H Foster Williamston Mich	Capt C D Koch (Logtown) Pearlington Miss
Miss L B Knapp Plymouth Mass	D Woodward Clinton Mich	W Bice Jeddo Mich	J J Gelding Weldon Creek Mich	B T Webster Louisville Miss
Dr R H Mansur Princeton Mass				W H Swann Loch Leven Miss

List of voluntary observers of the Signal Service, etc.—Continued.

P E Blumer Moss Point Miss	Prof W A Buckner Nevada Mo	Chas Seltz De Soto Nebr	Cpl H E Wilkinson Carson City Nev	J L Binford North Conway N H
J B Allen Macon Miss	Max Eimbreck New Haven Mo	E B Taylor David City Nebr	W T Crane (Cranes' Ranch) Elko Nev	Miss Helen M Clark Plymouth N H
W H Snow Natchez Miss	Henry Bruhl Oak Ridge Mo	Dr I Humphrey Fairbury Nebr	W H Shockley Candelaria Nev	N B Waters Stratford N H
S J Russell Okolona Miss	Wm Kaucher Oregon Mo	Post Surgeon Fort Niobrara Nebr	Jackey & Drouillard Cedarville Nev	E A Knowlton Walpole N H
W H Hill Palo Alto Miss	B C V Brown Ozark Mo	Post Surgeon Fort Omaha Nebr	D Fowler Downeyville Nev	A A Higgins West Milan N H
Dr C W Bolton Pontotoc Miss	Silas C Turnbo Protom Mo	Post Surgeon Fort Robinson Nebr	J F Cupid Ely Nev	New Jersey.
Dr J A Mead Pearlington Miss	Wm Hirons Princeton Mo	Post Surgeon Fort Sidney Nebr	C H Sproule Elko Nev	R Ross Asbury N J
O A Carson Port Gibson Miss	Dr J R Mudd St Charles Mo	Robt Clegg Falls City Nebr	M M Ley Eureka Nev	H Allaire Allaire N J
Dr J W Stevens Rienzi Miss	L C Saeger St Charles Mo	P B Gailord Fairfield Nebr	P W Davis El Dorado Canyon Nev	Prof C F Richardson Beverly N J
J N Teunison Summit Miss	Post Surgeon Jefferson Barracks Saint Louis Mo	Isaac E Heaton Fremont Nebr	G W Dungan Genoa Nev	J H Preston Billingsport
Prof R B Fulton University Miss	Prof F E Nipher Washington University Saint Louis Mo	W A Harshbarger Franklin Nebr	H H Robinson Gold Mountain Nev	H A Jordan Bridgeton N J
A J Sanderson Vaiden Miss	C G Taylor Sedalia Mo	G W Talbot Grant Nebr	Miss Mary Estabrook (Hot Springs) White Plains Nev	Rev W J Leggett Belleville N J
A Erikson Water Valley Miss	J S Chandler Shelbina Mo	J B Moore Grand Island Nebr	Agent C P R R Humboldt Nev	Dr J F Leaming Cape May C H N J
W S Davis Waynesborough Miss	E A Pinnell Steelville Mo	G S Truman Genoa Nebr	Geo Garrison Hawthorne Nev	H Y Postma Egg Harbor City N J
Prof J Reeves Washington Miss	G L Osborne Warrensburg Mo	John P Finley Gering Nebr	J A Feraro Mill City Nev	Miss A S Yard Freehold N J
W S Coleman West Point Miss	Prof J H Frick Warrenton Mo	Wm Waterman Hay Springs Nebr	N P Dooley Pioche Nev	R N Cornish Gillette N J
H C Goosey Yazoo City Miss	Capt Wm Hughes Willow Springs Mo	G D Carrington Howe Nebr	Agent C P R R Palisade Nev	M M Cook Hanover N J
Missouri.	J R Dudley Wither's Mill Mo	Mrs M G Erickson Kennedy Nebr	Wm Oothout Palmetto Nev	J M Dalrymple Hopewell N J
L T Theilmann Appleton City Mo	Montana.	D Henderson Jr Kimball Nebr	W S Devoe (Agl Ex Sta'n) Reno Nev	Dr F C Price Imlaystown N J
L Benecke Brunswick Mo	Post Surgeon Fort Assiniboine Mont	University of Nebraska Lincoln Nebr	D Bonnelly Rioville Nev	Geo. Fleming Junction N J
Dr A M McKenzie Centreville Mo	Post Surgeon Fort Custer Mont	J M Tipton Lexington Nebr	W B Lawler Ruby Hill Nev	Dr G H Larison Lambertville N J
C F Day Craig Mo	Post Surgeon Fort Keogh Mont	John Ellis (Marquette) Central City Nebr	L Allen St Clair Nev	G W Hockenbury Locktown N J
Levi Chubbuck Columbia Mo	Post Surgeon Fort Maginnis Mont	J Hull Minden Nebr	T T Keay Sodaville Nev	J H Eadie Madison N J
Sgt A L McKae Columbia Mo	Post Surgeon Fort Missoula Mont	L S Trefun Mullen Nebr	Prof M D Bowen Tuscarora Nev	T J Beans Moorestown N J
Rev Fr Paul Conception Mo	Post Surgeon Fort Poplar River Mont	E W Black North Loup Nebr	C R Carter Verdi Nev	P V Spader New Brunswick N J
Dr J G Reaser Carthage Mo	Post Surgeon Fort Shaw Mont	J B Parmalee Nebraska City Nebr	Mark Averill Virginia City Nev	Prof A Scott New Brunswick N J
A Renisch Excelsior Springs Mo	J H Ray Glendive Mont	G S Clingman Oakdale Nebr	W Harton White River Nev	Mrs G H Cook New Brunswick N J
Prof T Berry Smith Fayette Mo	Wm Gaddis Fort Logan Mont	C Shieldstream Palmer Nebr	H White (Younts Ranch Nev) via Daggett Cal	Sgt E W McGann New Brunswick N J
W W Vermillion Frankford Mo	R C Clendenin Martinsdale Mont	E Smith Ravenna Nebr	New Hampshire.	F W Ricord Newark N J
Prof C W Pritchett Glasgow Mo	Dr J E Jenkins (Blackfeet Agency) Pigeon Mont	A B Hollenbeck Saronville Nebr	F W Palmer Antrim N H	W Lake Ocean City N J
E R Graham Grand Pass Mo	J M Graham Powderville Mont	P W Risser Syracuse Nebr	O F Cole Berlin Falls N H	Rev S W Knipe Oceanic N J
H L Hixson Hannibal Mo	Sarah E Sheldon Sheldon Mont	J S Spooner Sargent Nebr	Q A Bridges Berlin Mills N H	Dr M S Simpson Plainfield N J
Prof C C Swafford Harris Mo	Eugene Stark Virginia City Mont	W L Dunlap Tecumseh Nebr	W L Foster Concord N H	T Reed Princeton N J
A J Sharpe Harrisonville Mo	Nebraska.	Dr A B Nesbit Tekamah Nebr	Miss A E Pierce Chesterfield N H	J Fleming Readington N J
Chas Maushund Hermann Mo	G Shedd Ashland Nebr	J L Truman West Hill Nebr	N A Briggs East Canterbury N H	S Haines Rancocas N J
W H Delano Ironton Mo	Peter Fowlie Ansley Nebr	G Treat Weeping Water Nebr	Ag'l Experiment Station Hanover N H	Dr W J Chandler South Orange N J
S J Spurgeon Kansas City Mo	W C Wood Bingham Nebr	E G Bruner West Point Nebr	Dartmouth College Obs'y Hanover N H	A D Atwood Tenafly N J
F D Chubbuck Kidder Mo	G Roberts Creighton Nebr	J R Campbell Weston Nebr	Lake Winipiseogee Cotton and Woollen M'fg Co Lake Village N H	E R Cook Trenton N J
J S Slaven Lamonte Mo	Prof G D Swezey Crete Nebr	Nevada.	W Little Manchester N H	F S Dunbar Union N J
H T Weight Lebanon Mo	G I Gilbert Crete Nebr	O B Vincent Austin Nev	Jackson Co Nashua N H	W T Wilson Woodbury N J
J R Eaton Liberty Mo	Sgt G A Loveland Crete Nebr	Prof J F Burner (Burner's Ranch) Elko Nev	C H Webster Nashua N H	New Mexico.
F King Marshfield Mo	E F Irwin Craig Nebr	Agent C P R R Beowawe Nev	C E Hosmer North Sutton N H	S M Rowe Albuquerque N Mex
A L McKae Marshfield Mo	Mrs L A Wibley Culbertson Nebr	G Nicholl Belmont Nev	W C Gale Newton N H	E A Sutherland Chama N Mex
R Paxton Miami Mo		Prof C W Friend Carson City Nev		J M Fish Coolidge N Mex

List of voluntary observers of the Signal Service, etc.—Continued.

Post Surgeon Fort Bayard N Mex	W L Annin Le Roy N Y	Prof O R Willis White Plains N Y	Ohio.	C H Morris McConnelsville Ohio
Post Surgeon Fort Marcy Santa Fe N Mex	W Hudson Stephens Lowville N Y	Post Surgeon Fort Niagara	Dr P H Clark Ashland Ohio	Dr T C Hunter Napoleon Ohio
Post Surgeon Fort Selden N Mex	Dr M A Veeder P O Box 602 Lyons N Y	Youngstown N Y	Buchtel College Obs'y Akron Ohio	Dr A M Beers New Comerstown Ohio
Post Surgeon Fort Stanton N Mex	F X Straub Middleburgh N Y	North Carolina.	Prof A D Morrell Athens Ohio	Jos A Hook New Alexandria Ohio
Post Surgeon Fort Union N Mex	R S Holmes (Marshland) Apalachin N Y	Dr Karl von Ruck Asheville N C	Prof H V Egbert Akron Ohio	H D Gowey North Lewisburgh Ohio
Post Surgeon Fort Wingate N Mex	C W York Malone N Y	T C Williams Blackman's Mills N C	P W Barton Bement Ohio	E U Hyde Orangeville Ohio
J E Whitmore Gallinas Spring N Mex	S Talcott Middletown N Y	H C Dunn Clear Creek N C	W E Sheffield Bellevue Ohio	Prof F F Jewett Oberlin Ohio
J E Smith Hillsborough N Mex	Director Met'l Observatory Central Park	Prof J W Gore Chapel Hill N C	S M Painter Bangorville Ohio	L E Holtz Ottawa Ohio
F W Chatfield Las Vegas N Mex	New York City	M E Mears Clarkton N C	E T M Williams Clarksville Ohio	C Stewart Poland Ohio
Richard Pohl Los Lunas N Mex	Post Surgeon Fort Columbus	T B Lindsley Douglas N C	Post Surgeon Columbus Barracks	Dr D B Cotton Portsmouth Ohio
Jose M Vega Nogal N Mex	New York City	L Crawford Franklin N C	Columbus Ohio	Dr D N Allard Pomeroy Ohio
R H Hills (Red Canon) Carthage N Mex	G A Yates New Lisbon N Y	Dr W F Ross Hot Springs N C	Prof B F Thomas Columbus Ohio	J W Manning Salineville Ohio
M A Upson Roswell N Mex	C A Wooster North Hammond N Y	Dr T G Harbison Highlands N C	Lieut C E Kilbourne Columbus Ohio	E Pence Sidney Ohio
New York.	Chas Fenton Number Four N Y	Dr R L Beall Lenoir N C	Cpl C M Strong Columbus Ohio	Miss Ruth Ellis Springborough Ohio
James P Mills Amersand N Y	N Nelson Ogdensburg N Y	Dr P L Murphy (Insane Asy) Morganton N C	G A Hyde 85 Kennard st	Peter Bowman Shiloh Ohio
F S Place Alfred Centre N Y	J P Davis Oxford N Y	Prof H L T Ludwig Mt Pleasant N C	Prof W F McDaniel Celina Ohio	Prof T H Sonedecker Tiffin Ohio
J P Slocum Angelica N Y	G H Hudson Plattsburgh N Y	J W Ashby Mt Airy N C	H Renick Circleville Ohio	Dr A Billhardt Upper Sandusky Ohio
Richard B Arden (Ardenia) Garrison's N Y	E B Bartlett (Palermo) Vermillion N Y	W G Boyd New Berne N C	C F Stokely Canton Ohio	M D McCorkle Vienna Ohio
Dr F A Winne Brockport N Y	L D Cummings Palmyra N Y	Prof G S Willis Oak Ridge N C	Peter M Herold Carrollton Ohio	Prof C W Williamson Wapakoneta Ohio
Prof W C Peckham 406 Clason ave	Wm D Lovell Pendleton Centre N Y	Prof A McIver Pittsborough N C	J W Hammitt College Hill Ohio	Dr O N Stoddard Wooster Ohio
Post Surgeon Fort Porter Buffalo N Y	W H Jeffers (near Perry City)	T C Harris Raleigh N C	W H Baker Ohio State University	Thomas Mikesell Wauseon Ohio
D B Stillman Brookfield N Y	Trumansburgh N Y	Dr Herbert B Battle Raleigh N C	Columbus Ohio	Prof J Haywood Westerville Ohio
Prof H Priest Canton N Y	Post Surgeon Plattsburgh Barracks N Y	Sgt C F von Herrmann Raleigh N C	B B Ault Demos Ohio	Dr F Young Weymouth Ohio
Thomas Manning Carmel N Y	Peter Vilas Potsdam N Y	J A Hedrick Salisbury N C	Mrs Edith E L Boyer Dayton Ohio	D Lorbach Waverly Ohio
R Sanford Miller Constableville N Y	Vassar College Obs'y Poughkeepsie N Y	H L Kimrey Soapstone Mount N C	C W Goodspeed Elyria Ohio	L S Motte West Milton Ohio
G Pomeroy Keese Cooperstown N Y	J N Tilden Peekskill N Y	Prof E A Martin Southern Pines N C	H H Rose Ellsworth Ohio	Prof A B Willmott Yellow Springs Ohio
Post Surgeon Davids Island N Y	Wm Weaver Quaker Street N Y	T A Clark Weldon N C	Prof A C Redding Findlay Ohio	A G Frost Youngstown Ohio
Gerity Brothers Elmira N Y	DeWitt E Jenkins Queensbury N Y	Dr J M Gallagher Washington N C	G M Fink Fostoria Ohio	Oregon.
W P Hunt Eden N Y	Dr H C Sutton Rome N Y	J C Williams Winslow N C	S M Luther Garrettsville Ohio	John Briggs Albany Oregon
T P Yates Factoryville N Y	Post Surgeon Ft Wadsworth Rosebank	H Clay Williams Willeyton N C	C G Katzenberger Greenville Ohio	E H Andrews Alpine Oregon
Robert Warwick Fleming N Y	Staten Island N Y	North Dakota.	Dr T W Gordon Georgetown Ohio	F L Carter Ashland Oregon
Mrs N S Yates Geneva N Y	Post Surgeon Madison Barracks	J W Leech Davenport N Dak	J Sanford Granville Ohio	Geo Bennett Bandon Oregon
Post Surgeon Fort Hamilton N Y	Sackett's Harbor N Y	S J Pound Gallatin N Dak	W B Longstreth Gratiot Ohio	T L Arnold Beulah Oregon
C H Spaulding Hess Road Station N Y	Selah B Strong Setauket N Y	Julius H Hoof Napoleon N Dak	D G Lewis Hassan Ohio	W R Grady Burns Oregon
James Hyatt (Honeymead-brook)	James E Wilson South Canisteo N Y	L M P Griswold New England City	James Bull Hanging Rook Ohio	State Agr'l College Corvallis Oregon
Stamford N Y	D C Sharpe South Kortright N Y	N Dak	Prof G H Colton Hiram Ohio	U S Engineer Officer Cascade Locks Oregon
Chas E Whitney Humphrey N Y	E Ripley Sherman N Y	F R Hill Steele N Dak	Prof N B Hobart Hudson Ohio	M C Close Creswell Oregon
G A Trowbridge Ilion N Y	R T Church Turin N Y	C A McKene Wahpeton N Dak	Dr J B Owsley Jacksonborough Ohio	E P Balch Dufur Oregon
Engineering Dept Cornell University	Thomas Birt Utica N Y	Post Surgeon Fort A Lincoln N Dak	Judge E C Wade Jefferson Ohio	F S Moore Ellensburg Oregon
Ithaca N Y	Post Surgeon Whitestone N Y	Post Surgeon Fort Buford N Dak	L J Demarest Kenton Ohio	Thos Pearce Eola Oregon
Prof E A Fuentes Ithaca N Y	Military Academy West Point N Y	Post Surgeon Fort Pembina N Dak	P W Eigner Kent Ohio	Dr G Wigg East Portland Oregon
Henry A Stone (Kingston) Rondout N Y	Post Surgeon Fort Schuyler	Post Surgeon Fort Totten N Dak	J D Hadermann Leipsic Ohio	Prof G W Shaw Forest Grove Oregon
R N Hunt Kendall N Y	West Chester N Y	Post Surgeon Fort Yates N Dak	W S Dean Lordstown Ohio	J S Gray Gardiner Oregon
J H Bailey Keene Valley N Y	Post Surgeon Watervliet Arsenal	T M Murphy Sanborn N Dak	Prof T D Briscoe Marietta Ohio	Wm Holden Grass Valley Oregon
	West Troy N Y			
	O F Corwin Wedgwood N Y			

List of voluntary observers of the Signal Service, etc.—Continued.

Dr J G Jessup
Grant's Pass Oregon
W F Locke
Huntington Oregon
A Smith
Heppner Oregon
W H Goudy
Hubbard Oregon
Dr E J Thomas
Hood River Oregon
P Britt
Jacksonville Oregon
J R Blackaby
Jordan Valley Oregon
W A Leslie
Joseph Oregon
Post Surgeon
Fort Klamath Oregon
W H Colwell
Lone Rock Oregon
J K Romig
La Grande Oregon
Rev Fr B Held
Mount Angel Oregon
Capt W Harris
McMinnville Oregon
G Venable
North Powder Oregon
J S Vinson
Nolin Oregon
Hon H E Hayes
Oswego Oregon
Sgt B S Pague
Portland Oregon
P Zahnes
Pendleton Oregon
W F Abshier
(Silver Lake)
Prineville Oregon
J McDonald
Saint Helen Oregon
W C Cusick
Telocaset Oregon
S L Brooks
The Dalles Oregon
A P Wilson
Tillamook Oregon
Dr H W Vincent
Toledo Oregon
G W Dalles
Vernonia Oregon
M A Baker
Weston Oregon

Pennsylvania.

Dr C B Dudley
Altoona Pa
Prof G W Bowman
Annville Pa
J Grathwohl
Blooming Grove Pa
Lerch & Rice
Bethlehem Pa
A H Boyle
Blue Knob Pa
M H Boye
Coopersburgh Pa
J E Pague
Carlisle Pa
C L Peck
Coudersport Pa
Miss Mary A Ricker
Chambersburgh Pa
Prof C M Thomas
Clarion Pa
R M Graham
Catawissa Pa
Miss E A G Apple
Charlesville Pa
Wm Loveland
Corry Pa
W T Gordon
Coatesville Pa
A L Runyon
Cannonsburgh Pa
H W Mullen
Centre Valley Pa

H D Miller
Drifton Pa
Theo Day
Dyberry Pa
T H Walton
Doylestown Pa
C F Sweet
Edinborough Pa
T B Lloyd
Emporium Pa
E S Chase
Eagle's Mere Pa
Dr J W Moore
Easton Pa
Jos Bell
Franklin Pa
G W Wood
Frederick Pa
J C Hilsman
(Forks of Neshaminy)
Rush Valley Pa
Prof S H Miller
Greenville Pa
E C Wagner
Girardville Pa
N Moore
Grampian Hills Pa
Prof E S Breidenbaugh
Gettysburgh Pa
H S Brunot
Greensburg Pa
T Meehan
Germantown Pa
Prof F P Leavenworth
Haverford College Pa
T B Orchard (Salem Cor)
Hamlinton Pa
Prof W J Swigart
Huntingdon Pa
Prof J A Stewart
Hollidaysburgh Pa
John Torrey
Honesdale Pa
S C Schumacker
Indiana Pa
E C Lorentz
Johnstown Pa
B P Kirk
Kennett Square Pa
J C Wucher
Lynnport Pa
F O Whitman
Lewisburgh Pa
H L Shull
Lansdale Pa
E E Weller
Lancaster Pa
Culbertson & Lantz
Lewistown Pa
D M Shelley
(Aqueduct) Logania Pa
Prof J A Robb
Lock Haven Pa
Geo W T Warburton
Le Roy Pa
S S Jenkins
Meshoppen Pa
J J Boyd
Mauch Chunk Pa
Thos F Sloan
McConnellsburgh Pa
W H Kline
Myerstown Pa
F Mortimer
New Bloomfield Pa
W T Butz
New Castle Pa
J S Gibson
Nisbet Pa
C F Heavener
Ottsville Pa
R J Mickey
Patterson Pa
J D Brennan
Pleasant Mount Pa
Chas Moore
Pottstown Pa

G H Dunkle
Philipsburgh Pa
Post Surgeon
Allegheny Arsenal
Pittsburgh Pa
J E Rooney
Petersburgh Pa
W R Wallace
Drexel Building
Philadelphia Pa
Post Surgeon
Frankford Arsenal
Philadelphia Pa
Sgt T F Townsend
Philadelphia Pa
Franklin Institute
Philadelphia Pa
R C Stover
Point Pleasant Pa
J L Heacock
Quakertown Pa
C M Dechant
Reading Pa
Rev W W Deatrich
Rimersburgh Pa
Geo Lowder
(Smith's Corners)
Point Pleasant Pa
W M Schrock
Somerset Pa
J M Boyer
Selin's Grove Pa
Prof Susan J Cunningham
Swarthmore Pa
Prof Wm Frear
State College Pa
B M Hall
South Eaton Pa
J A Roth
Seisholtzville Pa
Rev M Gustin
Troy Pa
Miss Cora J Wilson
Tipton Pa
R L Haslet
Tionesta Pa
Wm Hunt
Uniontown Pa
A W Batterly
Wilkes Barre Pa
Dr J C Green
West Chester Pa
H D Deming
Wellsborough Pa
Chas Beecher
Wysox Pa
Prof W F Wickersham
Westtown Pa
W C Kimber
Waynesburgh Pa
Mrs S H Grenewald
York Pa

Rhode Island.

N G Herreshoff
Bristol R I
N Helme
Kingston R I
C O Flagg
Kingston R I
G W Pratt
Lonsdale R I
Post Surgeon
Fort Adams Newport R I
Thos Dunn
Newport R I
C H Cannon
Olneyville R I
J H Walker
Pawtucket R I
Office City Engineer
Providence R I
D W Hoyt
Providence R I
Prof Winslow Upton
Providence R I
Woonsocket Water Works
Woonsocket R I

South Carolina.

Dr W H Gedding
Aiken S C
E L Woeltz
Brewer Mine S C
W G Peterson (Belmont)
Newberry S C
W R Godfrey
Cheraw S C
Prof M Whiting
Columbia S C
Hon A P Butler
Columbia S C
Pvt J W Cronk
Columbia S C
M P Daggett
Conway S C
J W Earl (Evergreen)
Holland's Store S C
P H Walsh
Florence S C
Sarah A Crittendon
Greenville S C
W J Evans
Hardeeville S C
C B Webb
Jacksonborough S C
Colin Macrae (Kirkwood)
Camden S C
H D Elliott
Port Royal S C
Miss N L Dawson
Simpsonville S C
J F Bayerly
Spartanburg S C
J T Gray
Spartanburg S C
Dr W W Anderson
Statesburgh S C
E Gillard
Troy S C
J Pagan
Winnsborough S C
H G Reid
Walhalla S C
J R Schorb
Yorkville S C

South Dakota.

W P Butler
Aberdeen S Dak
W S Hill
Alexandria S Dak
Prof Louis McLouth
Brookings S Dak
Wm M Cappett
Canton S Dak
W H Boals
Clark S Dak
Thomas H Ruth
De Smet S Dak
F J Cross (Cross)
Etta Mine S Dak
Post Surgeon
Fort Bennett S Dak
Post Surgeon
Fort Meade S Dak
Post Surgeon
Fort Randall Armour
S Dak
Post Surgeon
Fort Sully S Dak
G A Perly
Flandreau S Dak
W W Butler
Highmore S Dak
Sgt S W Glenn
Huron S Dak
A S Stuver
Kimball S Dak
D W Diggs
Milbank S Dak
Mrs M F Goddard
Onida S Dak
John J Swartz
Parkston S Dak

J A Parker
Scranton S Dak
J H Warren
Spearfish S Dak
Prof C W Fawcett
Vermillion S Dak
Arthur Betts
Webster S Dak
L O Libby
Woonsocket S Dak
G W Frink
Wolsey S Dak
Tennessee.
A T B Etheridge
Arlington Tenn
J K P Wallace
Andersonville Tenn
Rev C F Williams
Ashwood Tenn
P B Calhoun
Austin Tenn
J I Hall
Covington Tenn
A A Arthur
Cumberland Gap Tenn
Prof J A Lyons
Clarksville Tenn
Dr A Slack
Cog Hill Tenn
F Hughes
Dyersburgh Tenn
L Boynton
Dunlap Tenn
J F Pickett
Dyersburgh Tenn
C F Vanderford
Florence Station Tenn
J C Diemer
Fayetteville Tenn
W H Brown
Greeneville Tenn
J B Irwin
Grand Junction Tenn
Miss Bell Baker
Grief Tenn
R Downey
Hohenwald Tenn
W C Hall
Jacksboro Tenn
H M Young
Kingston Tenn
W J Inman
Kingston Springs Tenn
J H Burrow
Lynnville Tenn
A B Ewing
Lewisburgh Tenn
Prof J A Laughlin
Lawrenceburgh Tenn
Dr M D L Jordan
Milan Tenn
C Hawkins
McKenzie Tenn
J A McKenzie
Maryville Tenn
Dr J D Plunket
Nashville Tenn
Sgt H C Bate
Nashville Tenn
W C Thompson
Nunnely Tenn
J C Williamson
Parksville Tenn
Dr W F G Wilson
Rugby Tenn
Miss C M Nugent
Rogersville Tenn
F K Fergusson
Riddleton Tenn
H R Hinkle
Savannah Tenn
W J Breeding
Spring Dale Tenn
B P Fagan
Sharp Tenn
A S Curry
Trenton Tenn

List of voluntary observers of the Signal Service, etc.—Continued.

W E Watkins Watkins Tenn Dr C Buchanan Waynesborough Tenn C W Graves Woodstock Tenn	W A Snell Hearne Tex C F Conklin Hartley Tex W T Barr Huntsville Tex W M Smith Howe Tex D B McMillan (Caddo Peak) Joshua Tex Jos Cottam La Grange Tex Dr C M Ramsdell Lampasas Tex G W Krech Longview Tex J E Fisher Luling Tex Robert Hensy Margaret Tex S G Lackey Mesquite Tex J L Vaughan Merkel Tex Louis Runge Menardville Tex M M Yeakley Mountain Spring Tex Paul Wipprecht New Braunfels Tex C Runge New Ulm Tex A L Rush Ochiltree Tex H H Carter Panhandle Tex E H Snider Panter Tex K D Blankenship Pike Tex W Weiss Round Rock Tex C M Tilford (Silver Falls) Mt Blanco Tex A C Wilmeth Snyder Tex W P Martin (Sugar Land) Sartartia Tex W B Cormack Tyler Tex W H Cameron Waco Tex W H Godber Waco Tex	J Robbins Snowville Utah Vermont. W H Childs Brattleboro Vt H B Chamberlain Brattleboro Vt W B Gates 55 Elwood Avenue Burlington Vt H L Bixby Chelsea Vt C H Lane Cornwall Vt H B Lovering East Berkshire Vt Rev A Hazen Hartland Vt J W Hatch Jacksonville Vt Dr H A Cutting Lunenburg Vt H F J Scribner Strafford Vt Maj W T Payne Saxton's River Vt A Whitehead Vernon Vt B H Albee Weathersfield Vt	R W Starr Waterville Wash Morris McCarty Whatcom Wash Post Surgeon Fort Canby Wash care Astoria Oregon A Wilgus Fort Simcoe Wash Post Surgeon Fort Spokane Miles Wash Post Surgeon Fort Townsend Port Townsend Wash Post Surgeon Vancouver Barracks Wash Post Surgeon Fort Walla Walla Wash	Wm Werner Fort Fetterman Wyo F T Wright Lander Wyo F S Lusk Lusk Wyo J F Crawford Saratoga Wyo Chas S Price Sundance Wyo M R Johnston Wheatland Wyo Post Surgeon Fort Bridger Wyo Post Surgeon Fort Russell Wyo Post Surgeon Fort Laramie Wyo Post Surgeon Fort McKinney Wyo Post Surgeon Camp Pilot Butte Rock Springs Wyo Post Surgeon Fort Sheridan Mammoth Hot Springs Wyo Post Surgeon Fort Washakie Wyo
Texas. Oscar Samostz Austin Tex Dr Q C Smith Austin Tex J G Sloan Brenham Tex W H Potter (Bear Creek) Brady Tex H Stevens Brazoria Tex J F Mayo Brownwood Tex F R Blount Colorado Tex J S Rogers Columbia Tex Prof Duncan Adriance College Station Tex W H Hamilton Box 169 Corsicana Tex E L Gibson Corsicana Tex G H Chipman Childress Tex C F Mercer Dallas Tex M E Glass Dallas Tex H D Donald Decatur, Tex J C Edgar Duval Tex H Graves Epworth Tex J N Morris Forestburgh Tex A Striegler Fredericksburgh Tex Jas G Mallette Ft Worth Tex Post Surgeon Ft Bliss El Paso Tex Post Surgeon Ft Brown Brownsville Tex Post Surgeon Ft Clark Brackettville Tex Post Surgeon Fort Davis Tex Post Surgeon Del Rio Tex Post Surgeon Ft Eagle Pass Tex Post Surgeon Ft Elliott via Miami Tex Post Surgeon Ft Hancock Tex Post Surgeon Ft McIntosh Laredo Tex Post Surgeon Camp Pena Colorado Marathon Tex Post Surgeon Ft Ringgold Rio Grande City Tex Post Surgeon San Antonio Tex Lum Woodruff Gallinas Tex D F Ragsdale Gainesville Tex D D Bryan Galveston Tex Sgt I M Cline Galveston Tex A B Gant Graham Tex P D Sanders Haskell Tex D R Sanders Houston Tex	Utah. H C Wallace Alta Utah Rev J D Gillilan Beaver Utah Post Surgeon Fort Du Chesne Utah A B Larson Levan Utah E Caffall Losee Utah R Moncur Mt Carmel Utah H C Davidson Mt Pleasant Utah H J Crouse Moab Utah W W Crossman Ogden Utah W R May Nephi Utah N Anderson Richfield Utah Seth A Pymm St George Utah Post Surgeon Fort Douglas Salt Lake City Utah C F Annette Rocky Mt Bell Tel Co Salt Lake City Utah	Virginia. Ashby Miller Alexandria Va G F Eakle Bolar Va C R Moore Birdsnest Va H D Walters Christiansburgh Va L J Heatwole Dale Enterprise Va D K Witte Fall Creek Depot Va Post Surgeon Fort Monroe Va Post Surgeon Fort Myer Va Washington D C Prof H D Campbell Lexington Va W N Stone Liberty Va A T Lincoln Marion Va R V Gaines Mossing Ford Va G Dunn Nottoway Va Prof J M Colson Jr Petersburgh Va W H Pleasants Richmond Va J R Purdie Smithfield Va B W Jones Spottsville Va S C Wells Salem Va W C Headrick Staunton Va J R Sim Summit Va James Wearmouth University of Virginia Va	West Virginia. Henry Resseger Ella W Va L F Miars (Mt Alto) Hartmonsville W Va J E Murdock Kingwood W Va A W Cook Oceana W Va D Titchenell Pleasant Hill W Va M J Coniff Rowlesburgh W Va J R Sharer Seven Pines W Va F M Swann Tyler's Creek W Va G H Trembly Tannery W Va	Foreign. Rev Eugene S Willard Juneau Alaska Jos Zuboff Kiliisnoo Alaska Prof J Bolam Govt Naviga School 14 Dock Place Leith Scotland Dr C F Hering Burnside (Coronie) Colony of Surinam Dutch Guiana S A G J Gibbs Grand Turk Turks Islands Brit W I Director Meteorological Obs'y Guanajuato Mexico Gen Russell Hastings Hamilton Bermuda Dr Enrique del Monte Astro and Met'l Obs'y Park Vedado Havana Cuba Prof M Leal Leon Guanajuato Mexico Director Astro and Met'l Obs'y Mazatlan Mexico Director Cen Met Obs'y City of Mexico Mexico Prof C H McLeod McGill College Obs'y Montreal Canada Capt Adolphus Peele New Westminster British Columbia Prof P Scherer Meteorological Obs'y Port au Prince Hayti Director Catholic Institute Pueblo Mexico Director Institute de Ciencias del Estado de Zacatecas Mexico J Byrns La Logia Sinaloa Mexico John Bell Topolobampo Sinaloa Mexico J Higgins Saint Johns Newfoundland Curtis J Lyons Honolulu Hawaiian Islands
		Washington. R M Hoskinson Blakeley Wash W H Mossman Chehalis Wash R C Willis Doe Bay Wash Mrs C B Carpenter Vashon Wash	Wisconsin. H Besse jr Butternut Wis B C Curtis Cadiz Wis Geo L Collie Delavan Wis J E Breed Embarrass Wis J C Wedge Fond du Lac Wis H M Crombie Glasgow Wis Dr M L Robey Grantsburgh Wis H J Thomas Greenwood Wis Henry Beal Hayward Wis C L Carr Horicon Wis J A McIntosh Honey Creek Wis A J Looze Lincoln Wis Washburn Observatory Madison Wis Miss Johanna Lups Manitowoc Wis Wm Heaslett Neillsville Wis Prof G M Browne Oshkosh Wis E S Koepenick Summit Lake Wis G H Yapp Waucousta Wis Hinemann Bros Wausau Wis C Rice Wauzeka Wis W H Anderson Weston Wis	Wyoming. J A Shannon Carbon Wyo

List of merchant marine steam and sailing vessels from which International Meteorological reports were received at the office of the Chief Signal Officer, U. S. Army, Washington City, in time to be used in the preparation of the Monthly Weather Review for March, 1890—Continued.

Name of vessel.	Captain.	Name of vessel.	Captain.	Name of vessel.	Captain.
<i>Sailing vessels—Continued.</i>					
Dr. sp. British Isles	G. Southcott.	Am. bg. Jennie Hurlburt	D. B. Darrah.	Am. schr. Oscar Schmidt	A. T. Bacon.
Ger. bk. Cape of Good Hope	Colin McLeod.	Br. bk. Jennie Parker	G. E. Barker.	Br. Otello	M. J. Bond.
Ger. bk. Charlotte and Anna	E. Kruger.	Am. bk. John J. Marsh	F. P. Whittier.	Br. sp. Parthenope	J. C. Heal.
Am. bk. Chas. Luling	C. Wiehe.	Am. schr. John R. Bergen	W. H. Squires.	Nor. bk. Prince Eugene	C. F. Nygaard.
Am. bk. Christina Redman	E. A. Watts.	bk. Jose E. Moore	A. Leonhard.	Ger. Prince Regent	F. T. Herwig.
Ger. bk. China	T. Selberg.	Port. bk. Julius	F. D. Vieira.	Br. sp. Queen of Scots	John Lamb.
Am. schr. Clara Godwin	F. Wyman.	Am. schr. Kate Church	J. H. Weeks.	Nor. bk. Qvos	G. Olsen.
Nor. bk. Compeer	I. H. Petersen.	Am. bk. Kennard	J. A. Bettencourt.	Br. Romanoff	G. W. Doty.
Ger. bk. Doris	C. A. Olsen.	Br. Lady Nairn	Thos. Richards.	Am. schr. Roger Drury	John Delay.
Am. sp. E. B. Sutton	N. Ohling.	Aust. Leandro	L. M. Martinovich.	Br. sp. Sapphire	G. W. Murray.
schr. Elsie A. Bayles	E. L. Carter.	Am. bg. L. F. Munson	J. V. McKowen.	Am. bk. Shetland	D. H. Haskell.
sp. Emily F. Whitney	B. Benson.	sp. Light vessel No. 45	Andrew Jackson.	Ger. Soli-Deo-Gloria	F. Abendroth.
schr. Ettie H. Lister	H. B. Rollins.	L. J. Morse	W. T. Savory.	Am. schr. Sullivan Gawan	R. Pitcher.
bk. Golden Sheaf	S. D. Mason.	Br. bk. L. M. Smith	S. J. Smith.	Br. bgt. Ubaldina	H. F. Schive.
schr. Harbeson Hickman	W. Chandler.	Am. bk. Majestic	N. C. Lorentzen.	Ger. sp. Union	H. Fokken.
sp. Henry A. Faber	B. Collette.	Ger. Margarethe	E. Suppher.	Am. schr. Warren Adams	C. A. Colcomb.
Nor. bk. Henry Villard	H. E. Garlick.	Am. bk. Matanzas	B. F. Rice.	bk. Willard Mudgett	Crocker.
Am. yacht Iroquois	F. B. Perkins.	schr. Maud H. Dudley	D. W. Oliver.	schr. Wm. F. Green	W. E. Crockett.
	N. Olsen.	Br. bk. Minden	R. MacDonald.	Wm. Wilson	Chas. W. Powell.
	R. N. Ellis.	Am. Neptune	J. Fred Hill.	bg. Woodbury	R. Cosgrove.

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NOTE.—In the future, there will be published quarterly, as a supplement to the March, June, September, and December issues of each year, the names of persons contributing to this Review.